

*Your*

An Angus Specialize Publication

SEPTEMBER 1985

C180

# COMMODORE

YOUR BEST INDEPENDENT COMMODORE MAGAZINE

## Graphics

Get in the picture with our graphics special

## C16

Program the C16 – the first part of a new series

## Sports

Be an armchair athlete

**Graphics**  
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**C16**  
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# COMMODORE 64



## MICRODEAL

# Our COMMENT

HAVE YOU EVER HAD A HANDICAP? TO be the computer generation's Leonardo Da Vinci have you ever wondered if your Commodore could be the instrument which will lead to the achievement of great heights of art and design? There is a whole world of artistic creation hidden away in your computer and it's just waiting to be let out. Think of all the marvellous programs you could enhance when your artistic talents have been unleashed upon the world.

You may think that this is just a flight of fantasy on our part. Maybe we're hoping that our readers are the best thing since sliced bread (which you are, of course!). However, now's your chance to realise all that potential talent by taking a look at our special graphics features this month.

First on the list is a special review section on graphics software packages. You can get expert opinion on how good each one is and how much use it will be to help you achieve your particular ambitions on the graphics front. It's also packed with lots of really important information like prices and names of manufacturers to make it all easier for you to get hold of. Not to be missed.

Graphics hardware is also dealt within detail this month. We look at four items of hardware - two lightpens, a touchpad and an electronic mouse (oh, that's not something to keep you sat happy on a rainy day). Even if you don't want to buy any of these particular items, then you'll find it interesting to know the facts about them for future reference.

Last, but by no means least, is our graphics program for the C64 which you can type in to get your own personal sketch pad for no extra charge. So if the prices of all these other items have scared you to death then never fear because we're still looking after you and your pocket.

## The sporting life

It is also an issue for those lazy armchair sports people who have never managed to get outside and pick up a racket of any description and the only things they ever run for are number 15 buses. We've brought together a collection of sports



games currently available and had a really good look at them. There's tennis, cricket, squash, baseball, soccer and fishing so if we haven't catered for your particular taste then it's not for want of trying.

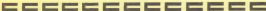
There's now a very wide choice of this type of sports simulation on the market and we've realised that armchair addicted someone to take the strain out of making a decision, so once again we've called sound and done what's expected of us. For the energetic reviewer was positively whacked by the time he'd been through them all, but we feel that it's done him a lot of good as his hands are now very clean and supple which is more than can be said for the rest of him.

So, just sit down in a quiet corner and have a read of the fruit of his great efforts. There's certainly something to be said for an energetic game of football in your own

home on a drizzly English summer day.

For those who are more interested in the ever popular sport of golf, then there's something for you too. We've managed to put together a competition with a sporting theme and we've got hold of 10 copies of APS's Nick Faldo's Open to give away. There's absolutely no end to our efforts to get you all fit and fonder to your whome. So if you don't like baseball and the events of tennis in the Wimbledon fortnight is still giving you nightmares then turn to our competition and you could find yourself having to choose between a bridge and a driver and wondering what an earth you're anyway!

And that's not all, of course, we've got all our regular features and bits of series to keep you at your keyboard for the whole month (five come at you in October with all your old favourites and some new stuff as well).





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Runarcade gives hints on adventures, including some for the Plus/4.

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# DATA STATEMENTS

## Front Loader

C. Itoh Electronics Ltd have just released what they describe as 'a revolutionary front-loading dot-matrix printer, with many unique features'.

The Etascan C-1 is aimed specifically at the Commodore market, and is equipped with both CBM 64 and VIC serial interfaces. The front loading design and built-in stand mean that paper, loads etc, can be stored directly beneath the printer and save upto 10% desk space. It also

offers two separate print modes, including standard, double-write, italics and reverse.

The printer accepts paper widths from four to ten inches, and carries four international character sets in standard (USA, UK, French and German).

And, if you want any more information after all that, then contact C. Itoh Electronics, Beacon House, 36 Worple Avenue, London SW15.

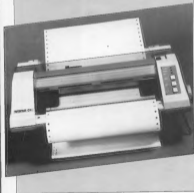


## Top of the League

ANOTHER FOOTBALL GAME HAS appeared, but this one, rather than being an all action arcade game, is actually a computer moderated board game.

Bryan Robson's 'Super League' is a game for up to eight players, that puts you in the position of a football club manager. Along with the computer assistant, dice, money, and 'other accessories' are included, and Bryan Robson has apparently said 'this is the best football board game I have played' (though he doesn't say how many of these games he has played).

Priced at £79.95 (U.K.), Super League should be available from branches of W H Smith's, for CBM 64, Spectrum and Amstrad from the end of July.



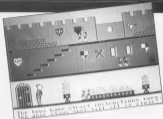
## Jolly good fun...

THIS AUTUMN, RUPERT BEAR IS 60 years old, and to join in the celebrations of this great occasion, Argus Press Software plan to release 'Rupert and the Toymaker's Party' on the Quicksilver label, for both 64 and Spectrum.

It seems that old Rupert has been left behind on the way to the party. To get to the party Rupert has to follow a trail of invitations leading through the Toymaker's castle.

With excellent cartoonlike graphics, it's challenging, addictive and jolly good fun! (That's what it says on the press release anyway), and will cost £7.95, here.

Argus Press Software, Liberty House, 222 Regent St, London W1.



## Performance...

FOR HIGH BLISS, ENH HAVE JUST RELEASED their Atkinson Performance, which presents a possible alternative to Commodore's own Sound Sampling system. Priced at £49 it should allow you to turn your '64 into quite a sophisticated synthesizer.

For more details, contact ENH at 14, Mount Close, Wickford, Essex.

## Computing for all



ARNDMORE ADVENTURE, A COMPANY specialising in educational and activity holidays for children, have recently joined forces with Crest Hotels to provide weekend computer courses for both adults and children. The first such course took place quite recently at the Crest Hotel, High Wycombe, with television

presenter John Craven present as special guest.

The courses, designed for both adults and children, are aimed at computer users of all levels, and cover topics such as programming (logos and advanced), word processing, information technology and educational software.

The equipment used in these courses is, surprise, surprise, all Commodore. The cost of a weekend course for adults is £85, but other deals are available for parents and children together.

You can contact either Arndmore Adventure (0544-64441), or Crest Hotels (0494-67715) for further information.

## All the way from America

ALL AMERICAN ADVENTURE IS TO HAVE just launched 'Exodus Ultima II' upon the British public. Described as an ' epic fantasy role-playing experience' it certainly sounds like the closest a computer game has yet come to duplicating the game Dungeons and Dragons.

Before starting the game, you must equip a party of four players determining their sex, strength, intelligence, profession and so on, just as in D&D. Once all this has been done, your players then enter the world of Soma, where you must mark down your enemies and defeat them.

If the price release is anything to go by, then it sounds like a very complex and challenging game. Available for the 54 from 20th June, Ultima II retails at £79.95 (incl.) and further details are available from: All American Adventures, Unit 16, Parkway Industrial Centre, Henegate St, Birmingham.

## Quickdisc plus

IVESHAM MICRO CENTRE HAVE produced what sounds like an excellent value cartridge in the Quickdisc. Designed to speed up the '84's 540 disc drive, the Quickdisc+ costs only £79.95, much cheaper than many similar cartridges, and offers the following facilities: Fast save and load 4 to 5 times faster than usual; Fast format (10 seconds); Fast file copy and file format as well as other features.

At £79.95, it sounds like very good value, and further details can be obtained from: Ivesham Micro Centre, Bridge St, Ivesham, Warwick.



## Epyx goes Gold

FOLLOWING THE WITHDRAWAL OF Epyx from the software scene, Epyx, the software subsidiary, have signed on with U.S. Gold, who will market the Epyx titles under their own label from July of this year.

Epyx titles include the past and present bestsellers, Temple of Apshai, and Incredible Mission, and planned releases for the next year include Summer Games II, Winter Games and P.B.I.

The people at U.S. Gold are describing Summer Games II as 'the greatest sports simulation product ever produced'. And Geoff Brown, MD of U.S. Gold, claims 'that the major share of the U.S. market that Epyx currently enjoys will assure an unparalleled success in the U.K.'





## The long-awaited Elite at last makes an appearance on the C64

FOR THOSE OF YOU NEW TO COMPUTING, if you've been around awhile, you must have been a hermit not to have heard of Elite has been the most talked about game since Space Invaders. Now, at last, it is finally outside the domain of the BBC micro circuit for which the game was first written.

Basically, you mean to be a trader, buying and selling goods to the planets within the galaxy. As you gain credits, it is possible to jump to the other seven galaxies within the Elite universe (though you won't have to worry about this for your first few weeks). Your aim is to gain credits by trading goods and also blasting pirate ships. As you do so, it becomes possible to increase the facilities of your ship. The cost of additions varies from 10 credits for a new missile, up to 6000 credits for a military laser. The availability of any given item is dependent on the "tech level" of the particular planet you are docking at.

One of the first things you notice with the Elite packaging is the high quality maintained throughout. This isn't your average game with the instructions

printed on the sleeve of the cassette case. This box contains plenty to keep you amused for hours, and that's before you even load the game. Before you read the instruction manual (called the "space traders flight training manual") I recommend that you read "The dark wheel" a mini (48 page) novel by Robert Holdstock, which is also included in the pack. It's quite good and should get you in the right frame of mind for the game.

The training manual, like the rest of the pack is a high quality document and is even longer than the mini novel at 84 pages. There are very few actual instructions in the manual. It deals more with the many aspects of being a space trader. There are eight chapters covering navigation and flying, interplanetary travel, combat, intergalactic trading, a political profile of the universe, and a guide to the other types of ship you may encounter on your travels. Formulas and keyboard lists are used throughout to aid clarity. Other items of documentation include, a mini ship identification poster, a quick guide to the keys that control your ship (33 keys are used in all in 6 different modes), and the last thing to come out of the box before the cassette is a cardboard keyboard overlay showing some of the most important commands.

If you have the cassette version of the game, it takes quite a while to load, but don't fear, it's well worth waiting for. The

screen display is split into two sections, the main view outside the cockpit (either right, left, front or back, whichever is selected). The other section of the screen shows the internal cockpit indicators. There are twelve of these in all, the largest being a 3D short range scanner. Also an view, front and aft shield strength, cabin and laser temperature, altitude, number of missiles remaining, compass, speed indicator, roll and climb status, and the amount of energy remaining in the four energy banks.

All transactions take place in the spinning space stations above the planets. It is here you start and this is the only place where you can save the game. For those of you who have never seen the game on the BBC, I am not going to give any hints as to how you can amass lots of credits quickly. Needless to say, it is important to gain confidence of flying and combat, as this is the way to achieve Elite status. There are many small things along the way that will help towards your goal, some that simply prevent you being destroyed. Keep your eyes peeled on to the various magazines, and I'm sure that you'll pick up all sorts of fun and pieces.

I can't give the brief description of the game that I've given here, you will realise that there is a high degree of complexity involved. Don't let this put you off, if you miss out on Elite, you miss out on one of the best computer games ever written.



Margaret Webb goes back to school and takes a look at Pre-school maths.

IN THE LIGHT OF THE RECENT REPORT from Her Majesty's Inspectors on the ability or otherwise of our children to tackle mathematics competently it is worth looking at the range of material available for the Commodore 64.

It has been suggested that more are should be made of calculators in the classrooms. This is all very well as long as the user has the basic ability to understand the numbers being used and be able to spot any errors made. This all leads back to early learning and a good grounding in basic number skills. With good foundations in the concepts involved more advanced skills should slip easily into place.

There are computer programs to cover all levels of mathematical skills from pre-school through to 'O' level revision and even a package aimed at the adult market dealing with mathematics in a business context. However, just because there are plenty of programs it does not mean that they are all good. As with the material available for the teaching of reading great care must be taken before purchasing a program and all considerations, as to what is to be taught, examined.

As with the teaching of reading even the youngest child can be taught using the computer as a medium. One of the first skills to be learnt is the relationship between a number of objects and the numeric figure. There are several games on the market dealing with this. Commodore market an A.S.K. package called 'Let's Count'. This is a two cassette box containing four games. The first game Treasure Island has the child matching equal quantities of child on pirate ships to treasure chests on islands. The second game moves on to matching objects in a space station to numbers. Space Hopper starts with the difficult concept of more, less or the same by asking the child to decide whether there are more red packages or fewer balloons they are loaded onto the space ship. The final game in the package gives the child practice in getting the numbers in their right order; a correct answer gains a reward in the shape of Mr Mouse ringing bells.

Each of the games is well thought out, has beautiful graphics and effective use of sound.

Microsoft have a package with similar aims to Let's Count. 'Count with Oliver' is a double sided cassette. On one side Oliver, a delightful cartoon character,

## Pet



learns how to count in a nursery. He also teaches the user the figure that fits the number. On the reverse Oliver learns single addition and subtraction in a nursery. This version of Oliver buying sweets, adding more and then eating — subtracting — some.

One of the few early learning programs I have seen recently is marketed by Fisher Price, a firm with a good name in the toy world. Their 'Up and Add' kit is a cartridge based program which aims to teach number, figure relationships and simple addition. It uses the 'wing' business, ducks and penguins floating on strings of balloons to create a random. This program is an appealing and easy to use that my four year old son and plays by himself — he is learning too.

Further programs dealing with this part of learning numbers are Mr T's Number Games in which the child counts spots, as they jump on and off a leafybird and Toddler Tutor — Channel 8 software — which has a series on counting toys.

Of course, as with reading, all the concepts and skills learnt with the programs discussed are the sort of thing that most others automatically teach their children in the course of a normal day. We count eyes, shoes, with bottles on the draining board, in fact anything that comes to hand. We teach through hands on experience so why bother using the computer? Well, as every mother knows, there is more to a day's homework than counting biscuits and it's hardly to be able to at a four year old clown for a little time with a game which has been developed by a team of educationalists and computer experts. I am not advocating leaving your child with this computer for hours on end — you must take an active role in his education — but the Commodore 64 has the power in its graphics and sound capabilities to captivate him and hopefully he will get that basic foundation from which he will be able to build real understanding of mathematics.

Let's Count — A.S.K. — Commodore, 1 Havers Rd., Carby, Northants NN17 1QA

Count with Oliver — Microsoft — Heilmann Circus, London EC1P 1HQ

Up and Add — Fisher Price — M.H.B. Leisure  
Toddler Tutor — Channel Software — 31 Pothegate, Preston, Lancs.  
Mr T's Number Games — Dory Software — 72 Brookfield St., London W7B 2BF

## ULTIMATE PLAY THE GAME

### COMMODORE 64



"STAFF OF KARNATH" and "ULTIMATE" recommended retail price £9.95 inc. VAT. Available from multi-media, bookshops, computer, hobby and all good software retail outlets. Also available from ULTIMATE PLAY THE GAME, The Green, Ashby-de-la-Zouch, Leicestershire LE65 5JG (P&P are included). Tel: 0530 411403



# SPORTS GAMES

The range of sports programs is growing and the recent growth in the area of computer games has many parents worried. For example, baseball had never gained popularity in this country until the release of *Home Run* video game which shot to number one on the charts.



The problem with the game is one which is common with many low simulations and stems from the difficulty of maintaining the ball's position in space. With *Archie* in *Paradise* spatial awareness was essential because the stroke played depended upon the direction of the player's movement and where the ball made contact with the racket in an arc of

Impersonal Tennis uses a netball which is at right angles to the net. In this case the speed and arc of the ball can be seen but the traditional angle can't always be seen. Despite this I had found this version to be the most satisfying version.

is causing us anything seen in a 1000 years to come.

This is the most competitive area in terms of the number of games available. Activision are team with Devotion, Games have Davey Thompson's Devotion (with the promise of more when their conversion of Konami's arcade games becomes available), Midway's *Superstar Challenge* and Cinematix's *Superstar Games*.

Having watched a room of summer camp kids trying to outdo one another with the American game, I think I know what Ron Russell's film of *Quartermaster* in the Wailing Wall would look like. A cheap European wannabe, indeed.

The real average rise to the rule is 'Superstar' Challenges which requires a slightly different approach because it includes a system called 'powermint'. This means that the spend must be built up slowly, alongside a regular but very little effect. In addition to this the small effect



section requires rapid, co-ordinated joystick movements to score points. The range of games is also much wider than with the other packages, encompassing Cycling, Tennis, and Judo, featured in

As usual, Activision have gone for complexity of game systems at the expense of graphic quality. This means the instructions to think for us users is to grasp and needs someone like me reeling

allow the car to leave the track but type your results from rubbing along the edge of the track. Period can also run down in periods and seconds, hence the name. One screen is also horizontally to show



Summer Games, ball control, dancing among others including the dreaded anti dip

## Basketball and Soccer

Lined the release of Commodore's International Basketball, the only version of this sport for the 64 was One-on-One from Anagami. This is an emulates an all what was a training exercise with only two players alternately attacking or defending a ring a basket and from the other. Despite the fact that it was endorsed by two of America's basketball greats it never really got through to me. International Basketball, a 3-a-side version and at only doubleback, it was it rare for me of the much earlier International Soccer. In both games you control the player who is either required to go in possession of the ball. The chance is then yours as to whether you should pass, or take a shot.

Both International Basketball and International Soccer are good in a period of short duration and quite tight too.

## American imports

America's national sports, football and basketball, are available under the Activision name which isn't surprising since the firm is based in the U.S. Unfortunately in this office or perhaps others it will probably hold up the game's progress in the British software stores.

towards image's much more comparable World Series Baseball with its stunning graphic display and well thought out viewpoint. The game has not got the variety of Activision's program but its position in the software charts in recent months speaks volumes.

Unfortunately, the only version of American Football to come from across the sea is the Activision one with its enormous spreadsheet of instructions which I'm still trying to fathom out properly. Even if I watched the series on Channel 4, I only hope that someone really inspired enough to devise a computer rugby game.

## Motor racing

If we put contenders in this group are Pole Position (it's Gold) and Pitstop II (it's Silver). For once I have no preference since there are two totally different approaches to the same problem.

Pole Position is the older of the two games in the sense that it has long been a favorite with Atari owners. I believe it was also the inspiration for Bubsy or Burt Aquas Race which is a nice version of Pole Position at most times of the year. The aim of the game is to stay on the track and overtake the other cars to reach a maximum line place. So summarize the way they are, steering, speed and position.

Pitstop II on the other hand will not

your car is one window and your opponent's car is the other. The nice point about this is that you can watch your car drive down at your opponent's window or vice versa. You can in the game reveal the strategy, can you afford to make a mistake or will your petrol and tyre hold out?

## And the rest

When I think of all the sports I've passed a season are realize why I rated this a stunning two games. For example there's Karate in the form of The Way of the Fighting Fist, Professional Soccer, Graham Coxon's Ten Crockers (shot game), pool and billiards from Bubble Box (horror) and Winson, the excellent one-to-one simulation called Tagshot (Analog), the not so good Motorcycles (plans II) and BMX, tennis, tennis, the punch clock basketball and soccer, Match Training (both Analog).

To wrap it up to end on both Activision's Core from Argus from ballroom which is a new level for goal simulation.

Football one day a new sport will be created by a computer programmer in the way that Basketball was created by a film crew. What's towards me there's also a complete version of that, Real Football.

Many a word of advice. Most sports games have two player options, use them if there more fun than playing an increasingly large of games.



# Get more out of your CBM 64 Micro with the New Marconi RB2 Tracker Ball

Marconi's new Tracker Ball is superior to either a mouse or joystick and is easier to use. The RB2 design incorporates Marconi's vast experience in making Tracker Balls for Air Traffic Control and professional equipment which demands maximum performance and reliability. It is built like a gun and gives more precise positional control - the manual position on screen relates directly to finger tip movement on the ball. The three push buttons externally control the delete, return and copy functions but you can also assign your own functions to the buttons.



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## COMMODORE 64 OWNERS The Ultimate Reference Book



Programming The Commodore 64 by  
Bernie West

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15. The Commodore 64 is a powerful computer. It is a powerful computer. It is a powerful computer.

The man with the soldering iron, Mike Roberts, builds a device to make the Commodore cartridge port more accessible.

# HARD FACTS

THE PROJECT THIS MONTH BRINGS history of horrors — the construction of a PCB, or Printed Circuit Board. Actually for our purposes the meaning of 'printed' is a far cry from the usual ink on paper method.

A PCB is a sheet of blankless (or possibly other metals) that has on one or more sides a network of copper strips. Components are attached to the strips and thus make a circuit. The PCB is made by getting your base board, which starts off with copper all over it. Then you can go on the side to etch as necessary, and then removing all the excess copper.

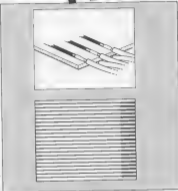
The design is printed on the board in permanent ink or in photo-resistant var. You then place the board in a mask box. The acid etches away all the bits you don't want and very precisely the last stage is finished. Here you take a drill and do any holes needed for components and solder them in. Then you're finished.

As usual in the age of the available tools, Tandem, I have been intrigued recently by learning Tandem as a source of all components. This is because they are expensive. True they are a bit pricy, but they are local and have everything you want. (Other sources tend to be mail order only, and you have to know what you are doing to order the bits. However other suppliers that I can recommend are Arpico, Radio Shack PCB, and Highland Electronics — see adverts in electronic magazines for details and addresses.

Tandem have a PCB etching kit at about £14, however they also sell the component parts of this separately and at a cheaper price, so it may well be worth using the assistant for help in getting exactly what you need. If you do just get the kit you will also need a wire to cut the board and a double sided PCB board, instead of the single sided one. As for other items are worked such as files, cranks, and wire cutters. Otherwise you will only need the equipment listed in earlier articles.

Now you've got all the gear you will want to know what you are building. Well it is a base expansion device that connects cartridge and add ons to the C64 via a cable. This means that you can attach your VCS and LDCs to the bus without disturbing the cartridge port. And finally it is all the dealing with the various things that you can attach.

Also it everything attached onto a cable it gives you more room to play with



at the rear of the machine for the longer peripherals that can be attached.

To do this you will need in addition to that which has been mentioned a length of ribbon cable 144 lines, though you can use strips of less such as two strips of 24 way cable as it's cheaper, and a 22 way double sided 0.1 inch edge connector. Tandem do not use these but they are available from most of the sources listed above.

Now you must cut the board to the same size as indicated in the diagram, check that it fits by showing it into the cartridge slot at the back of the C64 (on its power turned off of course!). Next you must lay out both sides of the board in the same way as in the diagram, with the right hand pin. The same pattern must go on both sides of the board and must be exactly the same connections at the diagram end of the board.

When you have etched your PCB you can strip the wires at both ends of the ribbon cable and separate the wires from

each other for about three quarters of an inch down the insulation. Now bend alternate wires up and down so that one numbered wire goes at top of the board and next numbered wires go down to the bottom. Tie the wires and the edge of the board with the 0.1 inch lines and solder the wires to the flat lines. Do the same with the edge connector at the other end. You will now have your completed board. Before plugging it in make sure that you have checked that there are no shorts between the lines as solder can fly, and the connections are very close together.

## Important Safety Note

The acid used to remove the copper on the board is Ferric Chloride and is extremely dangerous. It should not be used by persons under 16 at all and only by people under 16 with supervision. Also read the disposal instructions carefully — you wouldn't believe what it does to copper piping.



## COMPLETE CASHBOOK ACCOUNTING SYSTEM

Most important of all, in production a Profit & Loss Account and Balance Sheet, DEBIT and CREDIT entries, both keeping entries, together with those to the accounts and companies, etc. Most of the Credit/Debit entries need to be kept in a separate column, although any profitable accounting system, even one in production, should be able to do this.

- **Examples of Business Communications Pack** — includes processes HR Manual, HR Database, Recruitment, Stock Control



The No. 1 main driver, says **freight** **costs** pressure their **Midwestern** **owners** into the following features: **flexible** **major** **equipment** which allows the long potential of the **W's** **memory** to be fully used. **Search** and **release** **facility** which permits business field subsidiaries to be updated by any common accounting format. **Reaches** to all **affiliated** **subsidiary** **W's** and **high** **precision** **working**. **Performance** **standard** **second** **to** **others** **in** **the** **industry**.

## STOCK CONTROL

A 4.144-M program reflects neither extensive use of machine code nor extensive use of the computer's memory and provides almost instant

Up to 100 words each to share the final on each life with details including short references to, DESCRIPTION, Summary, Lasting Quality to which you refer, what others say

The group also includes the facility to add another source of income from research, which is based on the fact that there is a steady increase in demand for research and development. The company has a strong research and development program and is committed to research and development. The company has a strong research and development program and is committed to research and development. The company has a strong research and development program and is committed to research and development.

The garage will take much of the debris and old wood  
cans, and even have sawdust

[illegible]

It doesn't take long to see why for many, access to online stock information and online data through a simple membership system gives you a better tool than defined parameters to make your own decisions. Features include the ability to find a company's data, which isn't on the Dow Jones website, and to post letters to a variety of online investment services.

2000	100	100	100
2001	100	100	100
2002	100	100	100
2003	100	100	100
2004	100	100	100
2005	100	100	100
2006	100	100	100
2007	100	100	100
2008	100	100	100
2009	100	100	100
2010	100	100	100
2011	100	100	100
2012	100	100	100
2013	100	100	100
2014	100	100	100
2015	100	100	100
2016	100	100	100
2017	100	100	100
2018	100	100	100
2019	100	100	100
2020	100	100	100

A really remarkable review for the 84 of *Quanta* magazine (page 36) for the IBC there - now enhanced with numerous images. Budgets for all aspects of research and personal expenditure for the 10th month of the year and then record and compare annual expenditure as it happens. Complete electronic bank account database with the ability to generate standing order forms. Other useful spreadsheets: Fuel prices updates. Complete parking facility to display areas and trends of expansion, of a garage facility incorporated for the last year, a 64 to convert units.

10	10/10/10	10/10/10	10/10/10
11	11/11/11	11/11/11	11/11/11

Figure 1 consists of four bar charts arranged in a 2x2 grid. Each chart represents a different level of agreement with the statement 'The government should do more to help people who are struggling financially'. The y-axis for all charts is 'Percentage of respondents' ranging from 0 to 100. The x-axis for each chart is 'Level of agreement' with categories: 'Strongly agree', 'Somewhat agree', 'Somewhat disagree', and 'Strongly disagree'. The data is as follows:

Level of agreement	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree
Strongly agree	~85%	~10%	~3%	~2%
Somewhat agree	~75%	~20%	~3%	~2%
Somewhat disagree	~65%	~25%	~8%	~2%
Strongly disagree	~55%	~30%	~12%	~3%

Most practitioners believe in phone therapy for sensitive clients, stating that "You're no longer a person and you're not alone." In addition, 60% of therapists believe that it is best to have clients in their offices and not on the phone. However, 40% of therapists believe that it is best to have clients in their offices and not on the phone. However, 40% of therapists believe that it is best to have clients in their offices and not on the phone.

Please send us your **CD-ROM** to: **CD-ROM**, **CD-ROM**, **CD-ROM**

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100

100







THE COMMODORE SHOW, KNOWS AS THE PIT (now by no odd name) is an annual event eagerly awaited. What new hardware and software will emerge this year? Which way is Commodore going, and, this year, is survival going to be an issue? There are questions aplenty at the minds of thinking visitors to the Associated Homebrewers.

These questions are made more poignant this year, when we know that the absence of Jack Tramiel at the top of Commodore in the United States, and his re-emergence as the head of Atari, with the possible intention of taking revenge on those who were responsible for disposing of him, is making executives look over their shoulders! Furthermore, the recent sudden "unavoidable" departure of the top UK executive is another blow in the mind for anxious executives.

Joining the Associated is the first problem for newcomers. Two drivers, usually up to date, do not recognize the fact that the old Commodore Hotel is now under new French ownership! The first thing we find is that the show is on one floor only this year. We remember that last year's northern show was attended at relatively short notice and we wonder the fear that just before the show, potential exhibitors were offered stands for no fee at all, and we wonder some what if Commodore's cutting back on

At the time of writing, Apple has just closed two factories in the United States, making 1000 people redundant. Even at home similar seems to be going through a traumatic period, with Robert Scarswell leaving the company, and forcing Linda Crave to step down as Chief Executive. Worring times indeed, so the marketing boys must get it right this year, remember the VIC, it sold two million units and it's memory advance was rivaled compared with contemporary machines. A brilliant marketing success.

What about the P-1000 and the C1000? These have not been well received, although Guru Jim Butterfield maintains that they are good machines which have been under-rated. Nobody at Commodore seems to want to tell much about these machines, save to say that the handling points will continue to be evaluated. The Plus/4 will now be launched with an accounting package from IMPRS, a 1M4 disk unit, and a RMP 801 Dot Matrix Printer, at a saving of £100.

Ending users of the 64 are to be surprised with a package which enables them to save £200 on a disk drive, a monitor, the disk-based software. Alternatively, they offer 1M4 disk units, RMP 801 Printer, and the Programmed Board Processor for a saving of £270.

There is one apparent anomaly - the price of the 64 will not come down! However, new buyers are to receive a

another "instrument". The Sampler, which showed how the instrument is used to produce tape music in tune to the content for "19" was equally impressive. These products are near completion but not yet finished.

This was the story which waving other stands too. The Graham Gooch Cricket Game launched by AudioLogic was on show, but not for sale. It looked a pretty good game. A crowd was often present around the Melbourne Home stand, where there were Kanarc game machines played. The graphics on these were really good, and as attractions were enhanced by the opportunity to play against the World Kanarc champion.

Children were much in evidence this year. The show was opened by two speeches from the new James Bond film, and Graham Gooch was on hand all Sunday morning. H-H Martin was being outdone by Psychobitch programs through their places on a variety of machines, including therapy, that at Atari these programs produce a light show which can program yourself to flash along with your H-H system. Really impressive! Especially so since you can try out your parties in and record them for future playback, perhaps at a party!

First Software had an impressive display of books and software, all translated from german. Distributor products. Their books dealt with a variety

# - COMMODORE

P.S., expenditure as well as top personnel!

To the Commodore stand! There we find displays of the much-announced and pre-ordered Commodore 128. There it is, as large as life, with programs running, and the very much three colored (automated garboid) 1571 disk drive as well. Arrangements to find out when this will be in the shops are, as usual in the micro-computer business, rather flaccid, but beginning, at least by Christmas seems to be the best guess.

A Unix-type machine, the Commodore 1000, is around but programs very hard to find. Very high resolution graphics, multitasking, and much more are a feature of this machine. Commodore going back into the business sector, after its great success with games machines! What about the Amiga? Guarded comments seem to amount to this. Gid Wellington, Commodore's dynamic chief of software (last year he was dispatched to the United States as a trouble-shooting "Shaker and Haven") to get the Amiga out as soon as possible. What a task! He'd hardly know, because the Marketing people are package it in whatever way seems likely to bring in the sale.

casualty unit, and International Soccer game within the current recommended price of £99.

Commodore PCs are also much in evidence at the show, although the hard disk version is not in the shops yet. All the new gear looks very good and functions well. The PC system seems to operate the Flight Simulator perfectly, which is a notable tickle in a good indication of compatibility.

A Press Launch of the International Tennis, attended by Roger Kiser, the Television Actor who appears in a commercial as a certain aggressive young tennis player, was absolutely brilliant. The game itself following on the conveniently universal International Tennis, and the recently launched International Basketball compete a very interesting sporting high.

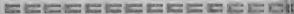
The picture of latest music programs was equally impressive. In addition to showing the programs which play Beethoven, pop songs, and also classics, the same team of programmers and musicians demonstrated a brand Synthesizer and Sampler. It was fascinating to hear how you could modify the sounds produced by your synthesized trumpet until wanted, and then turn your attention to

of aspects of the Commodore 64, from machine code to graphics. In addition, they had an impressive Complot, called, misleadingly enough, "Basic 107". This is worth examining if you want to compile BASIC programs into real machine code, or if you want to compile programs using extensions to BASIC, such as Macro, Simon's Basic, Vector, and so on.

Phoenix had a range of books for the 64 plus a very good Cribcard, concerning all these references which you want to much time looking for in reference works!

C Tech were showing a new version of their 100 dpi, text-resolution dot matrix printer. Priced at only £280 and available through a Commodore local connection, this provided full Commodore compatibility including graphics characters and raster-based printing, in addition to a whole variety of enhanced printing capability, including bit-image graphics.

Half Saunders were showing a wide range of books and "Complot" books including one on the Commodore 128. Others were showing their various interfaces for the 64, together with their Think-in-Chief Accounting package, recently purchased by Commodore to boost the P-1000.



Merde were showing a range of software, together with some hardware add-ons, perhaps the most interesting of which was the sturdy Superchip, which enables you to use IEEE parallel Commodore devices with the 64, at their full speed, and also to choose between three cartridges plugged into the sockets provided.

Previous hardware had three loose versions of Superchip and Superchip2 for the 64, together with a new program called Superchip. This enables you to learn to touch-type with a continuous pulsating ring.

Computel was being promoted, not only as a store, but also by the addition of a three month free trial subscription to Computel. This is a computer-based purchasing network which is usually accessed by telephone, but which can now be accessed by owners of the Commodore 64 and Modem.

Cometrons were showing their "Magic mouse" complete with graphics and operational software, which connects with the Data M50 Graphics Modem on the Commodore 64. Some of the makers were showing a variety of hardware add-ons, perhaps the most interesting of which was the add-on 544k/boards for the Commodore 64 which were very conservatively priced.

Domark Ltd were presenting their James Bond Game "A View To A Kill".



## SHOW.

together with a very dramatic display involving a car!

Superchip had a then usual games and software on display, but pride of place went to The Music Synthesizer which had taken Andrew Pratt, the author of the very successful "Mister" Records release, some months to create, test, improve and attract a lot of attention.

The Arming Band was a so crowded with enthusiasts. They were showing their voice-master speech synthesizer, the "Jump Jet" game which is more of a 1-g simulator for potential Hammer pilots, and their very impressive Sprite Machine 64. This is a rather interesting game designer and animator package. The Marzocchi Company was showing at its most prominent in the front room, where Sprite 40 could be played as part of a competition, complete with a lifelike figure of a Battle of Britain fighter pilot.

It is not possible to cover the entire Show in a short report, there were hundreds of floppy drives which acted as hard disk drives, extremely high resolution graphics packages for C-64/65/128, the Franked game for was at last on show, but not yet to take a release, a hard disk drive. My best advice to you is do not miss it next year, if you can this year!



# TOP DRAW

Allen Webb continues his series with an explanation of raster interrupts.

WILL LAST MONTH'S EPISODE WAS a little short and easy to type in. This month you're going to work for your ring. While the main loader will take a while typing in, I feel sure that you will find the investment in effort worthwhile.

This month's subject is the real area of raster interrupts. I'm probably on fairly safe ground if I say that these aren't many games which don't use the fancy feature in some extent. By the time you've read this article, you'll know why.

I'm a small dose of gentle background theory. In order to produce a picture, TVs and monitors have an electron gun which, under the influence of a magnetic field, scans the end of the tube. The picture information is carried down this electron beam. Each picture is built up as the electron beam scans across the screen as a sequence of raster lines. This all happens so quickly that you don't actually see the scanning. The 64, however, has a couple of registers at \$D010 and \$D012 which keep a record of the raster line being scanned at any given instant. You can also write a value to these registers and be waiting for a raster interrupt. You can also perform an interrupt every time the specified raster line is scanned. This feature, combined with a little jiggery pokery to allow for the difference between the 50 raster interrupt rate and the 60 raster main frequency and you have a raster interrupt routine. The routine can be directed to any machine code routine you choose. Since we're talking about scanning the screen, the usual application is to graphics.

The most frequent applications of raster interrupts are the generation of more than eight spots on the screen and the creation of a direct graphics mode. I will ignore spots since this application is tricky to implement and not necessary if you use a sensible approach to programming.

The basic of the program given here is to provide the means of specifying the

## Program Listing

```
1 ROR 127D40 2
2 ROR
3 ROR
4 ROR
5 ROR
6 ROR
7 ROR
8 ROR
9 ROR
10 ROR
11 ROR
12 ROR
13 ROR
14 ROR
15 ROR
16 ROR
17 ROR
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83 ROR
84 ROR
85 ROR
86 ROR
87 ROR
88 ROR
89 ROR
90 ROR
91 ROR
92 ROR
93 ROR
94 ROR
95 ROR
96 ROR
97 ROR
98 ROR
99 ROR
100 ROR
```

END

## Demo 1

```
1 ROR 0000 1
2 ROR
3 ROR
4 ROR
5 ROR
6 ROR
7 ROR
8 ROR
9 ROR
10 ROR
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87 ROR
88 ROR
89 ROR
90 ROR
91 ROR
92 ROR
93 ROR
94 ROR
95 ROR
96 ROR
97 ROR
98 ROR
99 ROR
100 ROR
```

END



```

1 DATA76,9,192,76,173,193,76,78,194,133,169,127,141,13,229,169,1,141,26,208
2 DATA173,172,193,193,251,173,134,192,141,18,208,169,24,141,17,208,169,63
3 DATA141,20,3,169,192,141,21,3,68,169,16,141,67,3,169,147,32,238,233,169
4 DATA144,32,218,333,96,173,23,208,141,23,208,43,1,248,52,198,231,16,7,173
5 DATA172,193,133,251,198,251,168,251,189,238,192,141,32,208,189,192,192,141
6 DATA93,288,189,22,193,141,17,208,169,7,193,141,22,208,169,128,193,141,24
7 DATA208,169,134,192,141,18,208,138,248,6,194,168,184,178,194,64,76,49,238
8 DATA1,241,227,233,229,229,221,217,213,208,208,201,197,193,187,183,181,177
9 DATA173,169,168,161,157,153,149,145,141,137,133,129,125,121,117,113,109
10 DATA185,161,97,93,89,85,81,77,73,69,65,61,57,53,52,12,11,11,1,1,13,13,12
11 DATA12,11,11,1,1,13,13,12,12,11,11,1,1,17,15,12,12,11,11,1,1,13,13,12,12
12 DATA11,11,1,1,13,13,12,12,11,1,12,12,15,1,15,12,11,1,15,12,11,1,15,12
13 DATA11,15,12,11,1,15,12,11,1,15,12,15,1,15,12,11,1,15,12,11,1,15,12
14 DATA1,15,12,11,1,15,12,11,1,15,12,1,27,27,27,27,27,27,27,27,27,27,27,27
15 DATA27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27
16 DATA27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27
17 DATA8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8
18 DATA8,8,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28
19 DATA28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28
20 DATA28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28,28
21 DATA6,3,173,66,3,281,48,208,243,96,32,68,194,165,28,56,223,1,221,46,144
22 DATA2,169,47,141,66,3,96,32,68,194,165,28,141,61,3,32,68,194,165,28,141
23 DATA2,3,32,68,194,165,28,281,3,144,2,169,8,141,63,3,32,68,194,165,28,281
24 DATA2,144,2,169,8,141,64,3,32,68,194,165,28,141,63,3,96,172,68,3,128,173
25 DATA61,3,153,182,192,173,63,3,173,238,192,174,63,3,169,53,194,153,22,193
26 DATA174,64,3,169,52,194,153,71,193,173,67,3,13,63,3,173,138,193,68,96,27
27 DATA91,59,8,24,32,253,174,32,138,173,32,247,189,96,32,195,193,32,213,193
28 DATA76,18,194,253
29 REM
30 REM MASTER INTERRUPTS REM (1985)
31 REM
32 FOR I=49152 TO 49743
33 REM K1 T=+X
34 FOR L=K1 TO NEXT
35 IF T=43356 THEN PRINT"ERROR IN DATA"

```

Parameter	Value	Effect
R1	0	Normal text
	1	Interlaced background
	2	Bit map
R2	0	High Resolution
	1	Atari colour
MA	0	\$0000
	1	\$0800
	2	\$0000 Upper case
	3	\$0000 Lower case
	4	\$0000
	5	\$0000
	10	\$0000
	11	\$0000
	14	\$0000

Basic Interrupt Commands			
SOS 49151			
SYS 49152-5C,BC,81,83,AB			
PPS,89158 14 5C 9C 81 82,9A			
As lower interrupt			
Change all of screen			
Change line 14			
R1	R2	bit	Effect
0	0	94	Upper case text
0	0	6	Lower case text
1	1	90	multicolour bit map at \$0000
0	1	6	multicolour lower case text

use on the screen, at which you want something to happen. We can, for example, tell the bit to change the screen colour at speed and places, giving horizontal bands of different colours. Keep about that later.

The basic loader is all you need to set up the interrupts. If you have a machine code monitor and want to save it as a direct loading file, the screen occupies \$C000 to \$C14F. These commands are available as summarized in Figure 1.

On activating the interrupts, you will be greeted with a rather dramatic effect of grey bands across the screen and loader. This is simply to let you know something has happened. The parameters in the other two commands are described in Figure 2.

13 channels between normal text.

extended mode and bit map. R2 selects normal text or multicolour mode. R1 selects the character memory position. Some examples are shown in Figure 1.

The system assigns the current bank setting so that you can set any bank you choose (the addresses for A16 to A18 = 3 must be set as used by loading BANK P0 = 0000). If you use the default bank 0, it is simple until you want to use undefined characters or bit mapping. To use these you must be at the start of BASIC memory; it is better to use another bank. Using 2 shows how to move to Bank 2. The bank has an image of the character ROM so that it is easy to use. Don't forget to protect this area, however, with

P0=10,152 P0=40,152

This effectively reduces the memory for your programs to \$C14F bytes.

The best solution, for the more knowledgeable, is to use bank 1 with the screen put at \$C000. It will be necessary to copy a character set to \$C000. With this arrangement, the area behind the screen ROM can be used for bit mapping without loss in BASIC memory at all.

The second command in Figure 1 updates the screen screen. This enables you to rapidly change the screen. The screen is effectively divided into 48 strips. These positioning is such that they correspond to the normal row of characters. The last command enables you to alter any specified strip. Both of these commands can be set up before to enable the interrupt should you want to get an instantaneous display.

Finally, the screen memory that the screen is at its default value of \$0400 in the corresponding position in the other banks. If you want to use a different position by polling R2 as follows:

Screen Offset	Value in R2
\$0000	0
\$0400	16
\$0800	32
\$0C00	48
\$1000	64
\$1400	80
\$1800	96
\$1C00	112
\$2000	128
\$2400	144
\$2800	160
\$2C00	176
\$3000	192
\$3400	208
\$3800	224
\$3C00	240

The simplest way to get to grips with the routines is to try the two dimensional routines. NOTE that both of these use BANK 2 so you must run using 2 first.

I hope you find these routines both useful and fascinating. In the first part of this series, I will discuss the concepts of screen windows and provide a machine code routine for their manipulation.

Figure 2

```

10 ROM ROM0 2
20 REM
30 ROM BOTH BIT MAP SCREEN PLUS TEXT
40 BPOS=(104030: SCREEN=094030+04250: SR=1294250
50 SVD 04
60 SYS SR+0.2,14.0,0.4
70 PRINT CHR$(127)
80 FOR I=000015: P0= SCREEN+1.1 NEXT
90 FOR I=00001599: P0= SCREEN+1.1 NEXT
100 PRINT "*****IMPROVE ME HAVE MULTICOLOUR BIT MAP"
110 PRINT "***** P0= SCREEN ROM RESOLUTION"
120 FOR LA=07015
130 SVD SR+0.14,0.14,0.2,0.4
140 NEXT LA
150 FOR LA=040340
160 SVD SR+0.14,0.14,0.2,1.0
170 NEXT LA
180 FOR I=0400 TO 0400+0300
190 P0=1.0 NEXT
200 FOR I=0400+0440 TO 0400+0400: P0=1.0 NEXT
210 FOR I=07015: Y=05100+10000+02: SVD07015: NEXT
220 FOR I=07015: Y=05100+10000+100: SVD07015: NEXT SVD
230 SVD+1010+01: CHR$(0)+1001: LINE#0 P0 P: SVD+0-04 AND P:
240 SVD+0400+0400+0400+0400+1,1
250 P0=07015-2101
260 RETURN

```

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A.P. & D.J.

Stephenson explain

the mysteries of  
searching and sorting.

The various methods of sorting data into some kind of order has occupied the minds of programmers for many years. Sorting data can be a lengthy process even in a computer and there are many different solutions to the problem. In

# T·H·E E·A·S·Y F·A·C·T·S



fact, to cover the subject of sorting in any detail would justify a separate series of articles on sorting versus searching. You may be asking why so many solutions are necessary, such there must be one better than the rest surely. Indeed this is not the case. Choosing the right one could depend on a variety of factors. Some solutions are easy to program and relatively easy to understand so it may be that these factors alone might influence the choice. For example, the solution known as the bubble sort is popular because it is simple. Indeed, the bubble sort is reasonably efficient providing there is only a small number of items to be sorted. However, when the number of items increases, the bubble sort takes far too long for most practical purposes because the sorting time is proportional to the square of the number of items. Thus, to sort 400 items could take sixteen times as long as to sort 100 items. In this article, we shall go straight to a highly efficient solution for sorting a large number of items when they are in random order. It is called the Quicksort and there is probably no significantly faster method for sorting a large randomly arranged list.

## The Quicksort

The Quicksort algorithm, devised and named by C. HOARE in 1961, approaches the theoretical minimum sorting time which can be shown to be proportional to  $n \log n$ , where  $n$  is the number of items. How large is a work function of  $n$  and does not



Program: IBM Demonstration of Quicksort algorithm

```
10 REM DEMONSTRATION OF THE QUICKSORT
20 REM ALGORITHM (STRING ARRAY VERSION)
30 PRINT CHR$(147)
40 INPUT "SET UP HOW MANY STRINGS?";N
50 DIM A$(N),S1$(16),S2$(16)
60 FOR N=1 TO N
70 A$=""
80 A$=10*RN*(1)+1
90 FOR I=1 TO A$
100 K$=24*RN*(1)
110 K$=CHR$(K$+45)
120 S1$=S1$+K$
130 NEXT
140 A$(N)=S1$
150 PRINT A$(N)
160 NEXT
170 PRINT:PRINT
180 PRINT "SORTING"
190 PRINT:PRINT
200 TI$="000000"
210 H$=1:TX=0:DOUB1000
220 K$=TI/40+0.5
230 REM DISPLAY SORTED ARRAY
240 FOR N=1 TO N
250 PRINT A$(N)
260 NEXT
270 PRINT
280 PRINT "SORTED"
290 PRINT:PRINT
300 PRINT "NOW SAVE A COPY OF THE SORTED STRING"
```



contribute significantly to the time so it follows that the sorting time approaches the same-order relationship. That is to say, it is almost directly proportional to  $n$ . For example, the time to sort 400 items can, under the best case conditions, be not much more than four times longer than the time to sort 100 items. Compare this with the bubble sort figures given in the previous paragraph.

The central idea behind the Quicksort is based on the observation that the speed of the simple bubble sort is quite acceptable provided the number of items in the list is small. It follows that if we have a large array and space into two sub-arrays containing different ranges of numbers and sort each separately, we will have a lot of sort- $n$  time. To do this, we make an initial partitioning as to the array elements that,

hopefully, will have a value somewhere around the middle. This element will be known as the pivot. All array elements having a value less than the pivot will be placed ahead of the lowest half of the array and all elements having a value greater than the pivot placed in the highest half. If these two portions of the array are sorted separately, either side of the pivot, then the array will be completely sorted. The choice of the pivot value is very important, for instance we could choose the first array element or the last array element or a random array element; if the list is partially sorted, as may occur in practice, the performance may be seriously degraded because the pivot will be too far off from the median value to make the split worthwhile. It would be like cutting a pack of cards leaving

about 8 on one side and 48 on the other. This effect can be reduced statistically by choosing the pivot as the mid-point element of the array. These are, of course, many other ways of choosing the pivot but we will employ the method incidentally, it is only too easy to point out that, under worst case conditions, the sorting time can be as poor as that for a bubble sort but this is extremely unlikely to happen in practice.

One method of implementing Quicksort is to keep splitting down the main array holding the items until they each contain, say, 15 elements at most and then bubble sort them. Taking the idea to the extreme, if we start on having two partitioning pieces, to the limit, then each subset will eventually contain only one element - in which case there will be no need to employ a

bubble sort at all!

To understand the Quicksort and to experiment with various numbers of items in an array, it is nice to have a program which includes facilities for filling it with random characters. We hope you will find Program 12.1 useful in this respect.

### Using the program

The first screen prompt will be "Set up how many items?". We suggest you try this first with a small number, say 50 in order to check if everything is OK. (It is conceivable that you may have made one or more coding errors when you entered the listing.) It will be easy to spot any out-of-order items because these appear in rooms on the screen to hold 10 of them. Once the number of items to be sorted have been entered, the program first

```

310 PRINT"ARRAY ON TAPE FOR TESTING THE
320 PRINT"VARIOUS SEARCH SUBROUTINES
330 OPEN 1:1,1,"ARRAY"
340 PRINT#1,50
350 FOR N=1 TO 50
360 PRINT#1,ASN:
370 NEXT
380 CLOSE 1
390 REM
400 REM =
410 REM =
444 REM QUICKSORT SUBROUTINE
4500 REM=0
4510 IF HL>TL THEN 1130
4520 PR=ASN:INT(ABS+TL)/2)
4530 IX=HL:JX=TL
4540 IF ASN<PR THEN IX=IX+1:GOTO 1040
4550 IF ASN>PR THEN JX=JX-1:GOTO 1050
4560 IF IX=JX THEN TL=ASN:IX=ASN:TL=ASN:JX=
4570 TL:IX=IX+1:JX=JX-1:GOTO 1040
4580 IX=JX:JX=IX+1:TL=IX-1:GOTO 1040
4590 IF IX=JX THEN GOTO 1010
4600 SPX=SPX+1:PX=HL:GX=TL
4610 IF GX=PX:GX=RX THEN SIX(SPX)=RX:GX(SPX)=GX:GX=
4620 PX:TX=GX:GOTO 1010
4630 SIX(SPX)=PX:GX(SPX)=GX:GX=RX:TX=GX:GOTO 1010
4640 IF SPX>0 THEN GX=SIX(SPX)+TX=GX(SPX)+SPX=SPX-1:
4650 GOTO 1010
4660 RETURN

```



display the items in random order. The clock from start and the sorting commences. At the end of the sort, the tape label is displayed. The program then arranges for the sorted list to be stored on cassette tape which means, of course, you will have to respond to the usual screen prompts for tape transfer in case you may be wondering why you want to put the list on tape, it should be explained that the tape will be required for the next program which deals with binary searching.

After you are satisfied that the program works in 10 to 15 seconds should write down to a magnetic screen, listing out successfully large numbers of items and recording the time. If only try it with a few thousand items to convince yourself that the Quicksort is a real improvement on the previous bubble sort. You will notice that successive items on the same number of items can differ. This is understandable since the array is filled with random characters.

## How the program works

**Demarcation:**  
The array **AB(100)** holds the list of array items. The stack requires two arrays, each requiring a consecutive 16 locations, **15(16)** and **15(16)**. These arrays are demarcated in line 50.

**Filling the dummy array:**  
The random characters are generated by the nested **FOR/NEXT** loops in lines 60 to 150. The inner loop, amongst other things, ensures that only upper case letters are allowed to enter the array. Random numbers between 1 and 26 are generated in line 100 and the next line adds 65 to them which lifts them into the ASCII region for upper case letters.

**Displaying the array items:**  
The outer loop repeats the process for all array items and prints them out in the created space, line 160. The time clock is started in line 200. The sort routine requires the **AB** and **first** arrays which are included in the call, called the head (**HP%**) and tail (**TP%**) which are assigned in line 210 before the call to **Q(15), 15(16)**. Quicksort then has the advantage of sorting items in the array

chosen limits of the array. For example by setting **TP%** to 20, we may sort just the last 20 array elements.

On returning from the subroutine, the sorted items are copied by the **FOR/NEXT** loop, lines 240 to 260.

## Quicksort subroutine

This rearranges the bottom of the program from line 1800 onwards. As you can see, it is not exactly light reading so it will require more than the casual glance to unravel it as Line 1800 initializes the stack pointer **SP%** to 3200 giving **SP%** forms an outer loop which executes repeatedly while the **HP<TP%**. These variables represent the head and tail pointers of the current array respectively.

Inside **TP%** and **TP%** eventually meet or pass (**TP%=>TP%**) the list is split into two sublists. All elements above **TP%** will be less than or equal to the pivot string, **PS**, and all elements below **TP%** will be greater than or equal to the pivot string. If both stacks terminate with **HP%** then the element at the array position is equal to the pivot string, **PS**, and is placed in either sub-list if it is already in its correct array position. On the other hand if the term terminates with **TP<TP%** then the same between **TP%** and **TP%** are all equal to the pivot string, **PS**, and are excluded from either sub-list.  
Lines 1890 to 1920: The stack pointer **SP%** is incremented ready for placing sub-list items on the stack. The array index limits of the lower sub-list are

various and needs to employ a fixed stack area of memory. However, the extra memory used by the stack itself is not excessive. The number of stack levels needed by Quicksort is given by  $\log_2(N)$ . Therefore to sort up 4,096 numbers the number of stack levels needed would only be 12 ( $\log_2(4096)=12$ ).

To give an idea of the sort times to be expected see Table 12.1.

Table 12.1 Execution Times of Quicksort

No. of items	Typical sort time (secs)
100	21
300	48
600	104
1000	474



Line 1930: The pivot, **PS**, is obtained by adding the head and tail pointers (**HP%** and **TP%**) and dividing by two. Taking the integer value of the result is hoped for under the median value array of the list as it is as close as possible.

Line 1940: Initializes the pointers **HP%** and **TP%** to start the scans from the head and tail of the current array.

Line 1940: The index **TP%** scans the current list from its head until an element is found that is greater than or equal to the pivot string, **PS**.

Line 1950: The index **HP%** scans the current list from its tail until an element is found that is less than or equal to the pivot string, **PS**. Line 1960: Provided the indexes **HP%** and **TP%** have not met or crossed the elements are swapped over so that they are in the correct list of the list.

Further scans are then performed until another pair of elements are found in the wrong sub-list.  
Lines 1970 to 1980: When the

**HP%** and **TP%** (head and tail) respectively) and **HP%** and **TP%** for the higher sub-list. The head and tail pointers of the sub-lists yet-to-be sorted are put on the stack. Thus if we are presently sorting the array between **AB(HP%)** and **AB(TP%)** then **HP%** and **TP%** would be placed on the stack so the sub-list **AB(HP%)** to **AB(TP%)** could be sorted later. In practice it is better to put the longer sub-list items on the stack and process the shorter sub-list array only. This is the task performed in line 1990. Each time a list is further partitioned in the outer loop the process is repeated. Once out of the loop in line 2110, the sub-lists, whose parameters were placed on the stack, are taken in sequence (last in, first out) and sorted in a similar manner.

It is often stated that Quicksort uses a lot of memory because the program being a recursive sort, i.e. a simple bubble sort. As it was more

## Searching arrays

Searching for a particular item within an array is a common processing requirement, even more common than sorting. The problem is concerned with comparing items in the array with the search key until a match is found.

## Sequential or linear search

This is the search algorithm most widely used because it is simple and obvious. It involves starting from the beginning of a list and sequentially comparing each element in turn with the search key in order that a match may eventually be found. If the end of the list is reached without finding a match the search is deemed to have failed. We used this simple technique in the listing program found in the feature of 'Your Connection'.

Program 10.2 Comparison of linear and binary search methods

```

10 REM COMPARISON OF LINEAR AND
20 REM BINARY SEARCH ALGORITHMS
30 PRINT CHR$(147)
40 PRINT"LOADING SORTED STRING ARRAY FROM TAPE"
50 OPEN "1,0,"ARRAY"
60 INPUT#1,AC
65 DIM A$(50)
70 FOR N=1 TO 50
80 INPUT#1,A$(N)
90 NEXT
100 CLOSE 1
110 INPUT"ENTER SEARCH STRING",F$
120 IF F$="" THEN 110
130 INPUT"USE LINEAR OR BINARY SEARCH (L/B)",K$
140 IF K$(1)="L" AND K$(2)="B" THEN 130
150 T1$="0000000"
160 IF K$="L" THEN GOSUB 1000
170 IF K$="B" THEN GOSUB 2000
180 T=T1/60
190 IF FLX=1 THEN PRINT"STRING FOUND AT ARRAY
POSITION ",JX
200 IF FLX=0 THEN PRINT"STRING NOT PRESENT"
205 PRINT"TIME TAKEN = "T" SECONDS"
210 INPUT"SEARCH AGAIN (Y/N)",K$
220 IF K$(1)="Y" AND K$(2)="N" THEN 210
230 IF K$="Y" THEN PRINT:GOTO 110
240 END
997 REM =
998 REM =
999 REM LINEAR SEARCH SUBROUTINE
1000 JX=0
1010 JX=JX+1
1020 IF JX=50 THEN FLX=0:GOTO 1050
1030 IF F$=A$(JX) THEN FLX=1:GOTO 1050
1040 GOTO 1010
1050 RETURN
1997 REM =
1998 REM =
1999 REM BINARY SEARCH SUBROUTINE
2000 LOX=1:HIX=50
2010 JX=INT((LOX+HIX)/2)
2020 IF F$=A$(JX) THEN FLX=1:GOTO 2070
2030 IF F$<A$(JX) THEN HIX=JX-1
2040 IF F$>A$(JX) THEN LOX=JX+1
2050 IF LOX=HIX THEN FLX=0:GOTO 2070
2060 GOTO 2010
2070

```

binary in this sense has nothing to do with the '1's and '0's normally associated with the word. It means binary in the sense of successive halving.

Assume the array has first been tested and according order, the data item in the middle of the 50 is first compared with the item to be matched. If the item is smaller than the required item, the search continues in the first half of the array. If the item is larger, the search continues in the second half of the array. On locating which half, the process continues as before by first testing the middle item in that half. Eventually, by continued halving, and testing, the required data item is either found or declared to be non-existent. On the



sequential searching, although seemingly easy to understand and program, is extremely slow because, on average, half the file will need to be searched before the required data is found. In other words, there will be on

average,  $N/2$  comparisons for  $N$  items in the search list. The worst possible case is, of course, when the required item happens to be the last one on the list, in which case there will be  $N$  number of comparisons.

### The binary search

A much faster method of searching an array, provided it is first sorted, is called the 'binary' search. Before proceeding, it is worth mentioning that the word

surface. This may seem a longer process than the simple sequential search, but that is only because it has taken longer to explain. (As an analogy, a good scientist is not only to explain but to explain what it looks like to those who have not seen it.)

The equation of interest is

$$\text{Average number of comparisons} = UDC \cdot n$$

where  $n$  is the total number of data items to be searched. This is a startling result and worth studying. In essence, it only takes twice the superiority of the binary search over the simple sequential search. Again, we wish to locate a specific item from a data total of 10,000 items. We will compare both methods.

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

A szerzők az alábbiakban  
 a szerzői jogok fenntartását  
 a szerzői jogok fenntartását

[illegible]

Average number of participants =  $LC(4\%) = LC(0.04) = 0.04$  = 0.04 (value is very small)

Even with one million stars the number of comparisons would only be about 200,000. A million stars would need only linear searching. Assuming such comparison to 10,000 stars, 20 million comparisons, this would mean a linear search time of 10,000 seconds (nearly three hours). However, it is only fair to stress once more that a binary search can only be carried out on a previously sorted array, whereas the typical search makes no demands at all on the order of the file itself. If an array is sorted in size, it may not always be worth troubling to sort beforehand and it certainly need not be sensible to sort it for the sake of using a binary search. On the other hand, if a file is to be accessed often and additional to the file are subsequent files, binary searching is a useful and convenient way of doing this.

whether you want to use the `search`, `list` or `binary` method of searching. The search then begins. If the search is successful, the area position number of the target word is displayed, followed by the location to find it in a word, copying this out with both methods many times, once in order to be total of that the binary method is far superior. For a word string in binary, area points are including the last and last. You should have a look at the greened area positions in order to park in a position a few positions. You can find easily down in the. For example, `search`.

### How the program works

The body of the program is quite straightforward, requiring only an outline explanation. The first uses the tape as the number of items which is read, not the ready for COMeasuring the array in line 10 to the FOR-401 loop which defines, where the tape data are the array A(10). The number *ary* (the character string which is in the variable) is entered by the operator in line 110, assigned to 15. Depending on whether the COMeasuring, in response to the prompt at line 120, enters 0 or 1, either character or the binary search algorithm is used.

the loop begins by comparing *IN* with the first array element which will be *ARR[0]*. The new constants to replace *used* and *a match is found*, at which point, the flag *FLG* is set to 1 and the loop starts processing by a branch to *RETURN*. After returning to the macro program, lines 100 or 200 depending on whether the flag was set at 1 or 0 will double enter the new constants, which will be *IN*, or a display the string *not found*.<sup>1</sup> *QED*

The binary search  
subroutine:

The macroeconomics 2000 to 2079 long 2000 assigns the values numbers, 10% and 11%, respectively, to the on real employment. The next use is the part of the main loop and finds the mid point of the current subset by simply halving the sum of the supported times 10% and 11%, each time until the loop

1999, 2000, 2001 and 2002  
and the 1999-2000 season.

Line 200 tests for equal  $\beta$  between the search string  $P_1$  and the middle array  $arr$ . If the equal is found, the flag  $P_1\%$  is set to 1 and the algorithm continues.

Line 2040 tests if the search string is less than ASCII. (The means of the ASCII code numbers are less, not the array numbers.) If `less` is true, then `04%` is then assigned to one less than the half way position, i.e. `04%` is similar except that it tests if `%` is greater than `Arg[%]`. If no, then `04%` is assigned to 1 more than the half way position.

Though three tests are carried out, each time around the mean line, until either a match is found or all data has been searched without success. The latter condition occurs when 10% likelihood higher than H<sub>0</sub> is low 2000 in which case the flag H<sub>0</sub> is set to 0 likelihood above 0.075, 0%.

Denomination  
rubles, kopecks

Program 12.1 is all a how-to for plugging the yourself whether the binary is superior to the linear search method) because either may be used in the program. You will remember that you will already have a unordered array as a ready on tape, a sequence from the previous program.

Using the program

The program begins by prompting you to load the assembly file; make sure that before running the program, that the tape is at the correct point on and all tape keys are OFF, otherwise there will be noise at the customary screen prompts. Once the tape has been loaded, you will be asked to supply the search string. "Exit" will end and answer the question.

### The linear search algorithm

The interval from 1000 to 1010  
The counter is 16, which is  
not required to be before  
entering the loop and a then  
incremented each time round  
The end of loop test, that all  
items have been checked, is at  
the top line 1010. Also on the  
line 1010, the 16 is set to zero

## References

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## VIZASTAR 64

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Year	Age	Gender	Height (cm)	Weight (kg)	Body Fat (%)	Max Heart Rate (b/min)	Resting Heart Rate (b/min)	VO2 Max (ml/min)	VO2 Max (ml/kg/min)
1990	20	M	175	70	15	180	70	3.5	20.0
1991	21	M	178	75	16	185	72	3.8	21.0
1992	22	M	180	80	17	190	75	4.0	22.0
1993	23	M	182	85	18	195	78	4.2	23.0
1994	24	M	185	90	19	200	80	4.5	24.0
1995	25	M	188	95	20	205	82	4.8	25.0
1996	26	M	190	100	21	210	85	5.0	26.0
1997	27	M	192	105	22	215	88	5.2	27.0
1998	28	M	195	110	23	220	90	5.5	28.0
1999	29	M	198	115	24	225	92	5.8	29.0
2000	30	M	200	120	25	230	95	6.0	30.0

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## Commodore 64 Kernel and Hardware Revealed

A knowledge of the Commodore 64 library software and the hardware with which it interacts is essential for all programmers wishing to make full use of the machine's capabilities. A thorough knowledge of the basic collection will give the programmer a wealth of ideas and methods for writing programming routines.



**Table 1**

Figure 1 shows the first two columns of results for the first two columns of the data. The first column shows the results for the first two columns of the data, and the second column shows the results for the first two columns of the data.

Class: 44  
Creative Professional and Technical Skills  
in Building Services – number 100-20-1-4

Messages: 440,000  
 Messages per second: 1000  
 Messages per second: 1000

The diagram illustrates the experimental setup. A participant is seated at a table, looking at a computer monitor. The monitor displays a stimulus area containing a target and a start button. A response area is also indicated. A clock is shown on the right side of the screen. The participant's hand is positioned over the start button.



Find out just what goes  
where with the first of Joe  
Nicholson's four part series  
for the C-16.

# PROGRAMMING THE C16

THE C-16 LMR MANUAL IS A FINE introduction to BASIC, but lacks a description of the many powerful commands accessible outside of the standard BASIC commands. Instead, it refers you to the C-16 Programmer's Reference Guide which contains unpublished at the time of writing. This series of articles sets out to explain these extra features.

## The Memory Map

As explained in the December issue of "Your Commodore", much of the hardware of the C-16 is based on one large chip, the 7901 or 7110 chip, which contains a 6502 processor with a two channel sound generator, a first class graphics generator, and some other important functions.

To plan a machine code program, it is important to know the way in which the processor uses the available memory. The overall memory map of the C-16 is shown in Figure 1. The main portions are as follows:

### \$0000-\$001F (0-3047)

2K of RAM used by the operating system. As on all 6502 based computers, \$0000-\$000F is from \$0000-\$000F and the BASIC is between \$0010 and \$001F (\$10 to \$1F).

### \$0020-\$003F (3048-3071)

1K of address lines. Used by the C-16 for the colour (bits 0-3) and luminance (bits 4-6) of the low resolution screen. As only 1024 of the 1024 bytes are used, addresses \$0011-\$001F (\$018-\$007F) appear to be unused.

### \$0040-\$001F (3072-4095)

1K of character pointers. These are the characters for the low resolution screen. Again only 1024 bytes are used, so addresses \$0015-\$001F appear to be unused.

### \$0000 (\$000-4)

This is the area reserved for BASIC. In fact, BASIC starts at address \$0001 (\$005), as address \$0000 (\$0000) must always contain 0. High resolution mode has not been selected, BASIC can go up to address \$00FF (\$03FF), but if it has been selected BASIC can only be written up to address \$001F (\$01F).

If high resolution mode has been

selected, the area of memory between \$0001 and \$001F (\$005 and \$001F) is used as follows:

### \$0000-\$000F (\$004-\$001F)

Contains the Luminance information for the Hi-res screen.

### \$0010-\$001F (\$018-\$001F)

Contains the colour information for the Hi-res screen.

### \$2000-\$200F (\$780-\$780F)

Contains the Hi-res screen data.

### \$4000-\$001F (\$028-\$001F)

A direct image of the bottom 1K of memory. Because it is that this space would have been occupied by an extra 1K of RAM, but perhaps Commodore thought this might be too competitive with the 64.

### \$8000- (\$2700-1)

The Commodore-16's operating system in ROM.

### \$0000-\$001F (\$0240-\$0270)

The two 80M character and upper page graphics, and upper/lower case.

### \$7F00-\$7F0F (\$0280-\$028F)

Registers to control the TMS chip. These registers are used to control sound, graphics, timer, and other important functions. A number of these registers will be explained in detail in later articles.

### \$0001-\$001F (\$0280-\$028F)

The kernel jump table. This contains jump statements to important routines in the C-16's operating system such as move or retrieve data on tape or disk, output text to screen or printer, scan the keyboard, update the system clock, etc. These routines function in the same way, and have the same entry points in the kernel as the Commodore-64.

### \$0000-\$001F (\$0280-\$028F)

These registers hold the address that the microprocessor will jump to on a Cold Start, so, when the computer is first turned on, or when the reset button is pushed, the address is \$0000 (\$0000).

### \$7F00-\$7F0F (\$0280-\$028F)

These registers hold the address that the microprocessor jumps to on a

machine code BRK instruction. This address is \$0001 (\$0005). A BRK instruction makes the C-16 jump into the Monitor with the message "BASIC".

The Plus-4 contains 10K of RAM for BASIC because it has the top 10K of memory, switching out the operating system and leaving a 10K of RAM. This memory banking is achieved using small machine code routines stored in RAM which have in the top 10K of memory read or write to a byte of the memory and then bank the operating system back so these routines are available for C-16 and are called by the operating system whenever a byte of RAM in the BASIC area is to be read from or written to. This means that the C-16 is capable of expansion to give the same amount of memory for BASIC as the Plus-4. Also it may be one of the reasons why the C-16 BASIC is 100% slower than the C-64.

## Where To Store Machine Code

Unlike the Commodore 64, there is no defined area in memory set aside for machine code. Code cannot just be popped into any free space however. When the operating system hands storage it continually fills up the free part of the BASIC area with garbage, converting even the best machine code "game loading game saved there. There are, however, three ways to overcome this.

### 1. Use the area below BASIC

The following regions appear to be unused on the C-16:

#### \$0000-\$0000 (\$025-\$025)

Cover the RAM area used for basic. (These do not appear to be used on the C-16 (no doubt they are on the Plus-4) making the space available for machine code.

#### \$0000-\$0000 (\$025-\$025)

These were intended for some speech packages, so if you don't require to use one, this is also free for machine code.

#### \$0000-\$0000 (\$025-\$025)

This is the BASIC run time (or G2M) stack. If your BASIC program does not have a large amount of G2M, this is a large proportion of this memory is available also. As the run time stack writes downwards from \$0001, it is not too far from the top part of this area. \$0000-\$0000

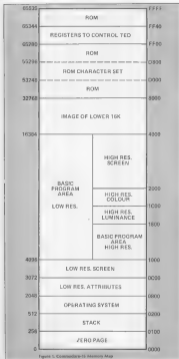


Figure 1: Commodore-16 Memory Map

(177,168), is as much as I could reasonably do.

Therefore, memory from \$04F to about \$070 (\$23 to about 168, about 161 bytes) appears to be usable for machine code. On the P card from 16 Kilo 1688 now 0 for use as a 16K. On the C-16, the area between \$0F5 (\$275) and \$0F7 (\$279) is not usable when the machine is completely reset, making permanent routines, such as reentrants to BASIC, possible.

## 2. Move up the start of BASIC

This is an excellent place in which to store machine code as it allows machine code programs of virtually any length to be written to an area that cannot be touched by BASIC. Unlike lowering the top of BASIC (see section 1), it does not use of both low and high resolution screens. Addresses \$28 and \$2C (\$4 and 44) contain the low byte and high byte respectively of the "Start of BASIC" pointer. This usually contains \$1001 (4097). To move the start of BASIC up 16 to \$1401 (\$421), therefore type

```
POKE $4,21
```

The byte below the start of BASIC, usually 4096, but 5120 when BASIC is moved up 16, must contain a 0 for BASIC programs to work. Therefore in the example type the following BEFORE moving the start of BASIC:

```
POKE $1,0
```

Finally, it is always wise to perform a NOW command, to set the string pointers to the correct values. BASIC, a new mode. All programs loaded after this will automatically load into the new address including the C-16 Assembler's recent publication in this magazine; avoiding machine code to be inserted straight into the first 16 block.

## 3. Move down the top of BASIC

This has the disadvantage of leaving the user to either low resolution or high resolution screen memory configurations. To move the top of BASIC, the "highest address used by BASIC" pointer at addresses \$27 and \$2B (\$3 and 35) and the location of string storage pointer at addresses \$24 and \$28 (\$1 and 32) must be moved downward. Usually a CLR command should be successful.

For instance in low resolution mode to make 16 available at the top of memory between \$2000 and \$201F (16384 and 16385), type the following:

```
POKE $27,POKE $2B,$2000
POKE $24,POKE $28,$2000
Addresses $2 and $1 already contain 16 and do not need to be changed, ie. $2016+$2017=$2019. This instruction sets the top of BASIC pointers to one less than the start of the cleared block. A "CLR" is used as it should be placed at the start of the program to preserve the values.

```

Next, though we shall be dealing with programs in a graphic character, one of the most important facilities not yet used in the manual.



## Load Runner



### Load Runner

★★★★★

AtariSoft

256K com/ST245 disc

CBM44

THIS IS AN IMPORT BY ARGOSGORE, previously produced by Bordenland in the United States. The copyright notice for Bordenland is dated 1993, so we were a little concerned that the program may be out of date. Happily this is not so!

You play the part of a highly trained Caltex Commando operating deep in enemy territory. A fortune in gold has been stolen from your people, and you are in the course of recovering the gold since the word "Load" is the name of the game.

By running, jumping, climbing ladders and ropes, (rather a novelty then), you move from platform to platform. If he gets too difficult, you can always create new passage-ways by drilling through stone floors and barriers, with the aid of your lasergun!

There is a good demonstration at the beginning of the game, which you get by pressing the joystick button, or any key except RETURN. Control is by joystick or keyboard. Users of the keyboard will be

pleased that there is a provision for slowing the game screen down, by repeated pressing of "V". Highspeed performers can speed it up by repeated pressing of the "W" key!

A good feature is the fact that you can pause the action by hitting ALT+STOP.

You are after a fine gold chest which are scattered around. On each screen a ladder miraculously appears at the top when your mission is accomplished. For this achievement you are rewarded with bonus points.

The guards rush about carrying gold in you must be pretty astute not to get it away from them. Your trusty Laser comes into action again, by dropping pits, into which the guards will quickly tumble. They get stuck in the pit, whereupon you may satisfactorily run over them. Accidentally, they drop the gold. You must not delay too long, as the pit gets it rid, and the man to appear at the top of the screen. Guards are able to climb out of pits which do not close around them, whereas you cannot!

A high-score chart is maintained on the disc.

Many extra features make this a very much out-of-the-ordinary game. You can shoot your map onto laser screens, if getting there legitimately is beyond your skill. Also you can add additional lines. I fear all these maneuvers means your score will not be allowed onto the high-score table, they are purely for practical.

The best feature of all is that you can design your own game, if you are not satisfied with the 120 different puzzles and scenes, you can design as many new games as you like for yourself!

The lot of parts can be used to construct an infinite number of different screens, simply by using numeric keys to put digits and undiggable floors, ladders, bars for hand-over-hand movement, gold chests, and enemy forces, whenever you wish. Very complete instructions are given which seem to be helpful, even going so far as to advise you about only having one player on your screen, and saving the game onto your own data file.

Graphics are good and sound quite good!

All in all this is an excellent buy and highly recommended.

### Jump Jet by Amiga

★★★★★

256K com/ST245 disc

CBM44 - joystick

THE VOICE OF TIGHT CONTROL crackles in my telephone. "Clive for voice-of Squares leader". Applying 80% engine thrust my Jetson Jump Jet slowly rises from the carrier's deck. At 100 feet I acquire the pre-coordination from vertebrae to 45 deg. forward thrust, raise the undercarriage and clear the carrier deck. Approaching 200 km I apply full forward power and raise the flaps. A complete transformation has taken place and my Jetson Jump Jet surges forward. The speedometer shows 400 km so I throttle back to cruising power. The radar display shows an enemy aircraft in the right margin, away, slightly to port, I bank to intercept. "Satisfied, I feel very loose. My hours of training are about to be tested to the full. Will I meet the challenge? Well I'll be one of those "Co, good back!"

Jump Jet by Amiga has added to the ever growing list of flight simulators for the 54. The program has an added "punch" in that speech has been

incorporated. It is the real life it over being put another flight simulator. The Jetson program boasts an 80-seconds and while you're in which do I need to see an equally fast belt out. Depending on the level you, flight control informs you that you are "Clear for takeoff launchers/ hazardous leader" and so on. First, a bird's eye view of the aircraft on the carrier deck is provided and, having thoroughly read the flight manual, you satisfactorily lift off. Above 50 feet, a side and end elevation of the aircraft and carrier are provided. This is essential to manoeuvre the aircraft back to the landing path. Above 200 feet the cockpit view switches to sea and sky with changing waves and rising clouds providing a good illusion of movement.

It is a shame that the horizon does not bank with the aircraft. The cockpit view amounts are reminiscent of Flight Path 212, as is the way in which the aircraft has to be within certain parameters during take-off, flight and landing. A warning sound if the aircraft is outside these parameters with the accumulation of too many warnings the warning message "Mayday! I'm falling out" and the end of that flight.

I was rather disappointed with the combat sequence. The enemy aircraft approaches head on and it is necessary to divert it with a gunned before firing a missile. If the enemy gets closer than two miles you will be destroyed and the Mayday message transmitted. In my opinion, a full-blown dog fight, with each aircraft going for position, would have been most exciting.

The landing sequence, as one would expect, is the most difficult. Depending on the skill level, the commander can vary from calm to nervous nervous and from calm to stormy weather. In the toughest conditions, the aircraft flounders around in a manner likely to draw the colour from the cheeks of the squaddie who never makes so long to meet Hammer pilot!

As with all flight simulators, thorough reading of the manual, coupled with a mastery of joystick and key combo, is required for a successful flight. Because the combat sequence is so tame, by today's standards, it doesn't fit my program will have lasting appeal to the younger player. If the price had been £25 first and not the current more exciting I would have given the program 4 stars.

JL

# Software Spotlight

## Chicken Chase

by  
Sarfent  
12/84  
Commodore 64

THE GAME WAS ORIGINALLY PRODUCED in France, but has now been translated into English. The game consists of two title screens, two small towns, and one graphics screen.

Yes, just one screen to play the game upon!

Each of the title screens is accompanied by a rather short tune. The second screen shows a large high-resolution picture of a chicken which winks at you.

The object of the game is to defend the chicken house, and stop the animals eating the farmer's eggs by pecking at them; the chickens that you can encounter while defending the eggs are: redphags, rats, toads, fish and another egg loving animal.

Chicken Chase I found to be best suited to the younger age group, although I don't think that this was the original intention.

Other keys or joystick can be used to move you around the chicken house to repel the attackers.

As if a game has only one screen gets very repetitive, even for a small child! Even at its low price it is not worth up to the standard of some of the other low price software. Overall the game is somewhat weak.

F.D.M.

## Jeppies Rescue

★★★★

IT IS A PLEASURE TO PLAY AN ARCADE type game which does not involve rapid movement. Playing a Jeppie is to land up around the stars of Los Angeles trying to rescue people in need the simplest of tasks. This is particularly true when you are encountered by (a) landlocks which will instantly break through the coverage of your airship. You must also avoid hitting bridges, buildings and even your home base. The slow but momentary progress of your airship means that you must anticipate the need to stop at good times and give the appropriate command. It must be rather like commanding one of those ocean going battleships which take about a mile to stop. This game will be enjoyed by people who get their excitement from creative endeavours, namely rescuing people, rather than destroying them.

The game is available on disc or cassette, we tested the disc version which loaded perfectly on all occasions.

You also have the unusual choice of how many times you wish to play it. Also you can choose how many ships you wish

to have for each game. In view of its difficulty, you will probably want the maximum number of four, at least to start with.

The joystick enables you to move the airship horizontally, vertically or diagonally. Somewhat strangely this is achieved by moving the joystick twice, once in each direction making up the angle, that is first north and last to go forward. This produces a line aimed at confusion. The airship has two speeds, the faster speed being achieved by a second push of the joystick in the same direction. To stop you must touch the joystick once if you are travelling at low speed and twice if at high. If you hit it once too often, the airship will rotate on its axis before starting to move off in the opposite direction. Independent pilots will find the manual, unresponsive nature of the airship and its control using left hand seems to be correct, and the engine noise seems to be particularly realistic.

You have five different screens, each of three distinct sky backgrounds and four game screen people, 40 in all. They are under threat from various environmental hazards and need to be rescued using the people wrapper. This is a small book at the bottom of the machine.

You can carry many passengers but you must eventually drop them off at the

base to get people loading a spare ship. You do this by exactly positioning the hook over a shoot which looks reasonably like a chimney.

During the game you are kept informed of the fuel situation and how many people are still in the cry-on board the airship, and at the base.

You must experiment on fuel because each time you touch the joystick you use up five gallons out of 1000, and of course time is running out if you should manage to rescue all people who are supplied with another 40. A hero's work is never done.

One of the problems with designing a game is the compromise between making it difficult enough to interest a veteran, whilst easy enough to encourage newcomers in the early stages. This has been well covered in Jeppies Rescue by providing a practice mode, in which the evil landlocks are moving that you can learn to manoeuvre the ship before things get tricky.

This is a well designed game containing difficulty with slow action. There is a need for this type of game, for not everyone can respond to the more frenetic type of Arcade experience. The use of graphics and colour is of a high standard, and the limited use of sound is extremely realistic. More levels of difficulty would be an advantage.

### Murder on the Zinderneuf

★★★★★

AppleLink

£91.95 (incl. VAT) inc.

£284.00

*Murder on the Zinderneuf* is based on a good story, being played in the 1930s, and in a confined space, in a way clearly set in Agatha Christie country.

The characters cannot escape your questioning, and the script was not laid for another 10 hours, when the trans-Atlantic journey ends. You have 30 minutes of real time to solve the mystery in this graphical adventure. You choose which detective you are going to be. The script of the games are not older, I'm sure, Agatha Christie, Inspector Maigret, J. Edgar Hoover, Inspector Kluge, J. Edgar Hoover, Inspector Kluge.

You put your questions in one of a number of styles, and can wonder about merely observing suspects' behaviour. You can go off in the Dining Room. Once you have been told who is missing, you are on your own. You will probably want to use your clues to be a different detective, because your effectiveness is determined by who you use. Clues are found by entering a room and moving round it. The working graphics at points like this are good. Some of the clues may be downright misleading. This is no mere 'Clue' type game.

You should not leave a room immediately you have found a clue, because there may be the most important clue of all in the room in addition. True to life you can only find the motive clue if your questions have earned significant information. This is a merit, because generally speaking you can only be attributed to

people after you have some information about them.

To interrogate a suspect you must 'bump' into them.

IN THE EARLY STAGES, YOU CANNOT jump in at random, but later you will have to wonder all over the map to find the suspect you want. You can use one of five approaches in questioning. There are different for each detective, and the result of these approaches will vary according to the character of the detective whose role you have assumed. The quality and length of the answers you get vary according to who you are now.

You can ask three questions at a time. This process is shortened by the fact that you merely select a suspect, by scrolling through a list, and then assume that the question is asked in the appropriate way. You can ask about more than one suspect, but your style of approach is not for that

particular encounter, from the start. You cannot question the same subject twice without having a go at someone else in between.

You can accuse a suspect whenever you feel you have enough evidence. If that suspect is guilty. AND if the suspect believes you have enough evidence to make the accusation stick, the game ends. You will get a rating dependent on your performance. Speed, a large amount of evidence found, and a small number of wrong accusations will give a high rating.

When your journey ends, you can have one last go at a Final Accusation. The suspect's name is read aloud to you, and if you are right your reputation as a detective will be increased, but not greatly.

All in all this is a fun simulation, with good graphics and reasonable use of sound. If you are fed up with *Shogun*, this will fill in some happy hours.

### Jet Set Willy II

★★★★★

Software Projects

£5.95

£284.00

MY HOPES WERE BARELY WARMED WHEN I READ that this was not so much a sequel as a reworking of the original. If, like me, you found Willy's first foray into the Jet Set too difficult to comprehend, then rest assured this is easier fare without losing the underlying cunning of the original game. Added to the many new screens and the potential should set your finger finger-pointing.

For the many who may not have met Jet Set Willy II, the story takes place after a wild party to celebrate Mayor Mayor Willy's big stroke. His wife, Mary, wants the house cleaned up before mum gets on after Willy can't go to bed.

Fam II takes place under similar circumstances except that Willy has been in hospital while little green men remodelled his house, which could account for the confusion of a spaceship. The house is full of a dizzying array of hazards, platforms, ropes and ladders must be negotiated to complete the clean-up that is.

In all there are over 100 screens some of which can only be accessed by the main 'entraining' space traveller after

meeting in a garage of another game involving a well-known bad-guy.

Although the music is less ambitious than the original game, the graphics are just as good, if not more so. With so many items to negotiate it will take many hours of enjoyment and frustration before a suitable map is completed. One word of warning: because of the talent.

Willy do Software Projects must be using their ill-conceived colour coded protection system on the game. Being red-green colour blind, the man responsible for the colour blindness, means that I have to tell someone else to select the code to run this wonderful game, and it's about time a different selection of colours was employed. (L.D.)

# Software spotlight

## GoGo the Ghost

by  
L. S. Gold  
©1984  
FIREBIRD

A GAME WITH TWO SCREENS, AT \$2.90, amazing! This game does have 150 screens, and it is hard to get through even one of them.

The object of this arcade/adventure is to rescue the GoGo's dream prince. This is done by cleverly guiding your ghost through real-time rooms of danger and evil. There is no time delay, because besides having to avoid the walls that are around, you also have to avoid the many of these species of monsters that are there to prevent your getting to the prince. Some of the ways that seem to be possible to get in, are in fact impossible, and may be the process of your attempting to get there, cause you to lose a life or two!

The graphics are colorful, but not spectacular. The ghost is well drawn, and monsters too.

Every room has a number, and some have passwords. When you start to play, you are asked for a password, and you can either type one in, or press RETURN. If you just press RETURN, then you will automatically start the game at screen one. Entering the correct password for one of the screens will start at that screen.

The instructions tell you one of the passwords, and the first of the cover picture shows another!

You can collect various stuff on your journey. If you are in a desperate situation, you can keep the fire button pressed down, which will make you invisible for a short while.

The screen maintains up-to-date information ratings for you about Life, Power and Time. You earn points by collecting piles of gold dust as you pass from room to room. Winning is achieved by passing through the well hidden Room 149 to Room 150.

Well worth the money.

## Review Up 'n' Down

by  
L. S. Gold  
©1984  
FIREBIRD

THIS IS A MCA GAME MARKETING IN England by L. S. Gold. You are driving your car along a series of roads with 60-degree bends and many intersections. Your aim is to collect flags which are literally laid along your route. This is not easy because you are hindered by a number of other drivers. Collisions with them result in the loss of one of your four lives.

The only way to rid yourself of this nuisance is to press the fire button on your joystick, for the appropriate key if you have selected the keyboard option,

and jump above these obstacles and, and upon them. They then obligingly disappear after a minor strategical explosion.

Phantom feedback and other strange looking objects can pass through these other cars and you must avoid them.

The various cars, there is for instance a mountainous version of the course, which must be tackled with care. If you approach too slowly, your car will roll downhill backwards!

As the start you choose between Easy, Medium or Hard levels, and one or two player game, plus of course, joystick or keyboard.

You must keep your wits about you in this exciting game. You are likely to find yourself in a dead end, or going off the track if you are not careful. You will then lose a life. You can leave scoring to your

robot driver, but must change direction and accelerate and decelerate yourself. Speed control is very important, since jumping can only be initiated when you have sufficient straight road in front of you not to go off track.

Similarly it is important to make sure there is no collision before you can carry out your jump.

There are three marks on all, and since you can control the speed of movement of your car, and therefore the speed at which you can play at your own speed. The sound and music are good, and the graphics are well up to standard.

This game may not sound very much when described, but believe me, it is totally addictive, even when played by a very experienced, and therefore somewhat blasé 10-year old game expert. Highly recommended.



## Ghetto Blaster

★★★★

US \$1

CD-ROM • 1994

GHETTO BLASTER IS UNUSUAL IN THAT although it is an action game, you do not do anyone any injury.

You are Rocking Rodney and must dash about Funky Town delivering messages for your employer. However, life is not too simple because you have to keep all the local mobsters happy by making them dance. This is done too easy because you must play your Ghetto Blaster and hear musical notes at them. The louder your machine is playing, the further your notes fly so that you can get them dancing from a greater range. Fortunately, your batteries don't last long (you know the feeling!) and you must get new ones to complete the task. There is no point in cranking up the volume to save power, because your store of music which you have already got to dance to is lost.

There is a map provided, but you had better memorize the district, because you are kept too busy to refer to it. You must avoid being caught by the local two-bit policemen, and sometimes with a very persistent Tony-deal Walker are best



avoided too, since the chance will damage your Blaster! You must then opt in to have it repaired.

The scoring in the game is simple. You either make it or you don't. This has a serious effect on the continuing playability of the game.

The soundtrack is set over the top of a very accurate representation of a ghetto blaster, complete with tape hiss, turning, cue counter, battery and volume indicators, the lot!

There is a very good demo with music that uses your machine's own owners too different tunes, played very well.

All in all I liked this game a lot. It shows off how very good 3D High-Res Graphics can be, and uses the sound chip very well. As a demonstration program to impress your friends it scores highly. However, lacking as it does any way in which you can return to the game again and again to try to beat your previous scores, I have a feeling it will be a one-day wonder. Maybe when you get tired of it you can swap it with a friend!

## Submark

★★★★

Available

on CD

and MS

ANOTHER CHEAP GAME FROM FIRE-ROD, but a very good! Well, this game is a text graphics adventure and a good one at that.

You are Isakram Grotto's son reporter, and you are in a nuclear submarine trapped on a sea-bed. The object is to send a message to GHO for me. This may sound like a piece of cake, but I must emphasize that this is a no mean task.

The sub contains a number of computers in which you visited an object, or more than one, and a few of these are useful in your effort to send the message. There are plenty of them to make it hard to decide which ones to use.

The graphics are well drawn, and appear on screen no no time at all.

There is a wide-ranging vocabulary which can be used to aid your effort to get help. This vocabulary contains most of the words which you expect to be able to use when playing your adventure, and a few more which have only been in the very best adventures (for example, there is 'Amish', 'Dominate' and 'Yato').

I was rather pleased to see that you could use abbreviations for direct use and

for obtaining a list of the possessions that you are carrying, and the ability to save the state of play at any point, for reloading after if you failed is a handy addition to any adventure.

This adventure has some hints and clues which can be found if you look hard enough! The vocabulary that is shown in the instructions you get with the game, is by no means complete. There are plenty of other words you can use, to get the result you are looking for.

All in all this is a pleasing adventure to play. The relatively small playing area makes it suitable for novice adventurers, and it even had some humor in it too!

Good value at the price.



# REFERENCE

This month Barry Miles has a title something for both the newcomer to Commodore machines and the old hand.

**Title:**  
Programming the Commodore 64  
**Author:**  
Risto Colin West  
**Publishers:**  
Jewel Ltd./c/o Biblio/Distributors  
Star Road, Partridge Green,  
Hornham, West Sussex.  
**Prices:**  
£14.95 + 10p P&P

WHEN RISTO WEST BRINGS OUT A NEW book, knowledgeable users of Commodore machinery at once take an interest. The reason is not hard to find: the very large sales, and worldwide accolades poured on "Programming the Pet/CBM" guarantee currency. Has he once again produced an encyclopaedia which enables you to delegate all other reference books to a far corner of the bookcase? Is the new book really the "Definitive guide to the Commodore 64", as the publishers claim?

Firstly let us see what exactly you receive for your money. The book runs to 400 pages including the index, and costs £14.95. In addition you can buy a disk or two tapes containing all the programs within the book, for £9.95, and £10.95 respectively.

There is a school of thought which suggests that it is good for your soul, or at least for your understanding for you to type in the programs yourself. It is claimed that you will get a better idea of how the code operates that way. I would dispute this. It is quite difficult enough to try to enter programs in accurately, especially if they have many DATA statements in them, without trying to understand them at the same time. Studying the printed version of the program in the book is likely to be much more fruitful in any case, most of us want to get working using new facilities, and not to be held back by tedious typing.

The first two chapters are an introduction to the book and to the machine.

The Basic Reference Guide follows,

## Programming the COMMODORE

# 64

### The Definitive Guide

Risto Colin West

The encyclopaedic reference guide to the Commodore 64 computer.

A Jewel Ltd. Publication

which is likely to be the version of the book most referred to by readers. Introductory material is followed by a detailed analysis of every Basic keyword. Each keyword is covered in whatever degree of detail is necessary. Its type, syntax, modes, tokens, abbreviated entry, and flagword, are all spelled out, and then a number of examples to use. The examples are fully annotated, so as to be understood by beginner and experienced users alike. A very useful feature is the cross-referencing to the contents of other chapters where relevant. This saves much fruitless searching, and avoids repetitions in the text. Especially attractive is cross-referencing to machine-code ways of doing something that is being shown in Basic. Similarly, the data about I/O include references to programs which carry out UARTS and RS485. Similarly, if you are reading about I/O, you are told where to find a piece of code which will

carry out a reset when you have accidentally converted the Basic interpreter that the old program has been removed from memory. All Basic error messages are given, with helpful explanatory notes, at the end of the chapter.

Chapter 4 covers "Effective Programming in Basic". This is a highly welcome feature, usually missing from books of this type. It covers flowcharting, system design, and again cross-referencing, file structure. The section on macros and Low-level Programming introduces the ideas of macros, documentation, use of macrofiles, and data input.

This section draws attention to unusual characteristics of Basic, which create pitfalls for the unwary and/or inexperienced. Speeding-up BASIC is covered, although it would have preferred to see a little more detail. However, since

# LIBRARY

again cross-referencing to other chapters comes to you.

Chapter 5 covers the architecture of the 64, and gives information on programming the Complex Interface Adapters. If you think the CIA is an intelligence network, then the section on investigating the CIA's will help to demystify the job too. A section on timing, and addressing leads into a discussion of commercial software, in cartridge, and on disc and tape.

The next chapter covers Advanced Basic. In addition to showing how Basic and its variables are stored, you are exposed to the special locations and features of Basic. Full details are given at the option of the keyboard buffer.

A machine-language program is entered for programming function keys. You are encouraged to modify the manner in which the 64 operates in a whole host of ways. You want to make certain keys repeat if held down? You are shown.

However, the real meat comes when the section "Dictionary of Interrupts in BASIC" is reached.

Enter the book on the PIC/BASIC, the volume gives a lot of Basic routines, and lower machine-code ones. Three factors appear to have influenced the final meet in the event publications of a book of Machine-language Routines by Ali Baba's American publisher, which gives machine language a spinners, usually there is the fact that BASIC and we are more readily understood. And finally the book could be published sooner if Basic routines were included simply because the debugging time is reduced.

That said, you are shown Advanced Basic program lines, have line numbers provided automatically, remember selected sections of your program, chain program segments together, and carry out a whole host of other machine commands as well. A variety of examples given, and this is a most reliable chapter.

Chapter 7 brings you into the area of Machine-Language. "Superman" is provided in an Appendix, for those who do not have a machine available. The introduction offers short machine language programs to get your feet wet. Addressing modes are then dealt with, with admirable clarity, and also a description of Op-codes, you are taken on a guided tour through various useful machine-language techniques, e.g. how to open an I/O, how to complement answers, and probably most important of all, Debugging machine-language programs. The use of monitors, and assembly manuals off this chapter.

Next comes "Machine-language methods specific to the 64, including the use of kernel routines, using both ROM routines, and the RAM which is broken under ROM, modifying BASIC, Verbs and Interrupts.

Chapter 8 deals with using Machine-language and BASIC.

Chapter 10 gives the entire Vocabulary of the 640 chip, asked and stored by helpful notes.

Chapter 11 is a fully annotated memory-map for the 64 and the VIC, covering the first one hundred ROM locations, the BASIC ROM, and the KERNAL ROM.

Chapter 12 is a full coverage of graphics.

This is a minor masterpiece of condensation. It includes a cross-reference table of key, CHR\$ codes, POKE value and a picture of the graphic code. Letters in spelling is covered, as is character editing, and of course, Sprites. However, as we might expect the space coverage includes such topics as extending of sprites available (A program using 32 sprites is given), animation, and smooth motion.

Sound is given the same thorough treatment in chapter 13. A very detailed analysis of the SID chip is followed by a music theory and music programs. These are pretty lengthy, and if you are interested, they will push you towards buying the tapes or disc.

Tape storage is given the full treatment in the next chapter, including tape protection (format not breaking).

Disc activities are covered in chapter 14. Useful programs abound. Problems with disc drives are examined, and the programs on the disc which comes with the IMI Disc drive are looked into.

Changing device number, in both software and hardware is covered. Serial interfaces can be printed using one of the utilities provided. File handling in Machine-language is covered.

The final chapters cover other peripherals including printers, plotters, joysticks, padlocks etc. An example of the thoroughness of this section shows where we are to find much as Alan Radley varies in use from Commodore-view, and how to use the BASIC interface.

The book finishes with 16 Appendices, covering ASC codes, Commodore ASCII codes, ROM/BIOS op-codes, Dec/Hex conversion tables, etc. etc.

There is no doubt that the serious user of the 64 will find this the sort of book which is referred to again and again, and to which forgotten or raised material will be found as entry making highly recommended.



# S·K·E·T·C·H P·A·D



Allen Webb brings you a  
really useful little sketch pad  
for your 64.

SO FAR IN THIS ISSUE YOU WILL HAVE read about efforts to ever software and hardware for the creation of artistic masterpieces. For those of you with the energy to go it on, here is a program which, while not being particularly sophisticated will enable you to do better than your heart's content.

The program operates in high resolution for map mode and offers the limitation of two colours per character space. For convenience, it will always think Clive's recommendations of ink and paint. This does limit the complexity of the colours you can use, but more detailed pictures are possible. The program is menu driven with seven options. The drawing options offer a number of operations and for simplicity I have used a consistent approach to commands, iterative use of border colour is made to state matters.

The program is controlled by a control in part 2 menu.

## Draw

The option enables free hand drawing and manipulation of individual points. Press the button to toggle between pen

up and pen down. Pen down... opens border draws on screen.

Pen up... white border... cursor moves without altering picture.

Draw... black cursor... press 0  
Erase... red cursor... press 1  
Clear screen... press H/Alt key

With the pen down, the movement of the cursor/cursor is drawn or erased. With speed set at 1 you get a solid line, with higher speeds you get dotted lines.

## Speed

Changes speed of travel. You can choose from 1 to 8 pixels per step.

## Lines

Initial border is dark blue (command mode). In this mode you can move the cursor and perform other commands.

Immediate and clear screen as far down mode. There is no test for pen up, so I've omitted it.

To draw a line:

1. Move cursor to one end of the line and press the arrow. The border will go light blue. A dot is drawn to show the end of the line.
2. Move cursor to other end and press the arrow. The line will be drawn.

## Circles

Command mode has a black border. All commands are used as for lines. To draw circle:

1. Place the cursor at centre point and press the arrow. The border will turn one shade lighter, and the centre will be marked.

2. Move the cursor to the point where the circle will cross the horizontal and due east from the centre. Press the arrow. The border will turn one shade lighter, and the point will be marked.

3. Move the cursor to the point where the circle will cross the Y axis, or due north of the centre. Press the arrow, and the circle will be drawn. The centre dot is then erased. Using the routine any shape of set point can be drawn.

## Air Brush

Yellow border.

This command allows you to shade areas with dots. The command fills a square area, with the cursor at its top left corner with a number of random dots. Two patterns are available, 16 by 16 and 8 by 8 pixels. Drawn like work as before.

To draw with the brush, press the arrow. To move the cursor without drawing release the arrow.

## Brush Parameters

This enables you to specify how many dots per square (1 to 255) and to choose the size of spray area.

## Colours

This allows you to redefine the ink and paper colours. A drawing action updates the area associated with the current colour. Careful use of state is done mode will allow you to paint areas of paper.

To enter status mode press H/Alt in any drawing mode. To exit speed, brush parameters, status, and colour options, press any key. To return to main menu from a drawing mode, press M.

[illegible]

# Program Listing 2 (cont.)

```

580 IF JP=10 AND XP<200-0.1 AND YP<200-0.1 THEN XP=XP+0.1:YP=YP+0.1
590 RETURN
600 END
610 REM UPDATE DRAW CURSOR
620 REM
630 XC=XP+18:YC=YP+45:POKE 53248,XC-INT(XC/256)*256
640 IF XC<0.0 THEN POKE 53248,XC+256:POKE 53248,XC
650 IF XC>256 THEN POKE 53248,XC-256:POKE 53248,XC
660 POKE 53248,YC:RETURN
670 REM
680 REM CHANGE SPEED
690 REM
700 PRINT "CLEAR":INPUT "SPEED 1 (SLOW) - 5 (FAST)":OK
710 IF X<1000 THEN
720 GOTO 140
730 END
740 SCREEN1800
750 IF PEEK(127)=4096 THEN
760 IF PEEK(127)=1 THEN POKE 53248,X:GOTO 750
770 IF PEEK(127)=1 THEN POKE 53248,X:GOTO 750
780 IF PEEK(127)=1 THEN POKE 53248,X:GOTO 750
790 IF PEEK(127)=1 THEN POKE 53248,X:GOTO 750
800 POKE 53248,X:GOTO 750
810 IF PEEK(127)=1 THEN POKE 53248,X:GOTO 750
820 SYS 40-12,XP,YP,DF,X1-XP,Y1-YP
830 POKE 53248,X:GOTO 750
840 IF PEEK(127)=1 THEN POKE 53248,X:GOTO 750
850 XC=XP:YC=YP:FLAG=0
860 XC=XC+1:YC=YC+1:IF XC=256 THEN XC=0:IF YC=256 THEN YC=0
870 IF XC=0 THEN XC=256:IF YC=0 THEN YC=256
880 X=X1:Y=Y1
890 IF XC=0 THEN XC=256:IF YC=0 THEN YC=256
900 YC=YC+1:IF YC=256 THEN YC=0
910 POKE 53248,X:GOTO 750
920 XC=X:YC=Y
930 IF FLAG=0 THEN XC=X:YC=Y
940 IF XC=0 THEN XC=256:IF YC=0 THEN YC=256
950 SLOPE=SLOPE+1:IF SLOPE=256 THEN SLOPE=0
960 IF SLOPE=0 THEN XC=X:YC=Y
970 NEXT
1000 GOTO 750

```

Program Listing (cont.)

```

1010 REM
1020 REM CLEAR SCREEN
1030 REM
1040 SYS 40,10,PA:POKEPIGGS,13:XP=0:YP=0:GOSUBS10:RET,PA
1050 REM
1060 REM SCALE SCREEN
1070 REM
1080 SYS 40+9,50:PEEK(S3200):POKE(S3200,0):POKE(S3701,0):POKE(S3702,0)
1090 PRINT"CLEAR:BLACK:WHITE:SCREEN:STATUS..."
1100 PRINT"DOWN:UP:PER:COLOUR:RVS:ON:":POKE(S3200,PA
1110 PRINT"DOWN:ON:COLOUR:RVS:ON:":POKE(S3202,10)
1120 PRINT"DOWN:DOWN:UP:PER: SPEED...:01
1130 PRINT"PER...",
1140 IF UP=1 THEN PRINT"DOWN" GOTO1160
1150 PRINT"UP"
1160 PRINT"PA...",
1170 IF SP=1 THEN PRINT"DOWN" GOTO1190
1180 PRINT"DOWN":POKE(S3200,0)
1190 PRINT"DOWN:DOWN:UP:PER: SPEED...:01
1200 PRINT"DOWN:DOWN:UP:PER: SPEED...:01
1210 PRINT"DOWN:DOWN:UP:PER: SPEED...:01
1220 PRINT"DOWN:DOWN:UP:PER: SPEED...:01
1230 POKE(S3702,0):POKE(S3702,1):SYS12*1000-0:RETURN
1240 REM
1250 REM CIRCLES
1260 REM
1270 CD=C:GOSUBS10
1280 IF PEEK(S3701)=0 THEN GOTO1300
1290 IF PEEK(S3702)=0 THEN GOTO1300
1300 IF PEEK(S3703)=0 THEN GOTO1300
1310 IF PEEK(S3704)=0 THEN GOTO1300
1320 IF PEEK(S3705)=0 THEN GOTO1300
1330 POKE(S3706,0):POKE(S3707,0):POKE(S3708,0)
1340 IF JUMPS(S3709)=0 THEN GOTO1360
1350 SYS 40+10,XP,YP,DP,CX=XP,CY=YP
1360 POKE(S3200,1):GOSUBS10:GOSUBS10
1370 IF JUMPS(S3710)=0 THEN GOTO1390
1380 SYS 40+10,XP,YP,DP,CX=XP,CY=YP
1390 POKE(S3200,1):GOSUBS10:GOSUBS10
1400 IF JUMPS(S3711)=0 THEN GOTO1420
1410 SYS 40+10,XP,YP,DP,CX=XP,CY=YP
1420 IF JUMPS(S3712)=0 THEN GOTO1440
1430 CX=C:CY=C

```

Program Listing - cont.

\_\_\_\_\_

## Program Listing (cont'd)

```

1890 IF C<CORRC+15 THEN C=C-15
1900 INPUT "END COLOR",IA
1910 IF C<CORFC+15 THEN C=C-15
1920 SYS16+4096=15,IA,PA
1930 GOTO1100
1940 SYS 40+5
1950 FOR I=3096,0
1960 FOR J=53088,1
1970 RETURN
1980 END
1990 FOR MACHINE CODE
2000 REM
2010 DATA 78,54,152,78,156,134,76,108,152,78,154,152,78,18,183,78,144,184,76,44
2020 DATA 104,66,76,76,68,78,38,67,68,68,68,38,48,67,54,52,70,70,62,72,68,73,67
2030 DATA 48,32,67,73,77,77,78,68,78,62,65,32,34,134,168,68,141,148,4,44,44,104
2040 DATA 168,80,141,130,3,168,84,141,168,164,0,133,168,162,84,76,168,152,168
2050 DATA 134,168,168,0,144,168,173,178,9,10,10,10,10,13,133,3,168,0,10,133
2060 DATA 132,173,2,221,8,3,141,2,221,173,0,221,43,252,8,8,141,5,221,173,17,208
2070 DATA 32,145,17,208,168,170,141,24,208,96,180,127,145,188,148,18,260,48
2080 DATA 168,168,168,168,188,188,188,0,101,188,141,188,184,202,208,270,76
2090 DATA 173,2,221,8,3,141,2,221,173,0,221,43,252,8,3,141,0,221,173,17,208,11
2100 DATA 273,1,13,17,208,168,81,141,24,208,96,32,34,134,168,68,141,142,1,42,34
2110 DATA 168,164,40,141,133,3,76,63,168,32,164,133,32,68,173,32,138,153,371
2120 DATA 34,11,7,141,141,3,58,168,7,237,141,3,141,141,3,24,168,1,174,141
2130 DATA 8,84,4,10,208,208,168,0,174,137,3,240,5,17,170,145,170,58,24,244
2140 DATA 170,145,170,58,32,34,184,168,70,141,134,3,168,84,141,134,1,32,74
2150 DATA 124,168,20,141,138,3,141,141,3,48,34,184,168,70,141,137,8,32,137,174
2160 DATA 78,14,168,168,0,6,252,0,252,101,252,134,252,80,173,143,7,74,74,74
2170 DATA 170,168,0,133,253,134,251,254,0,840,14,84,164,164,168,70,133,253,168
2180 DATA 84,168,0,133,254,252,208,240,24,168,253,108,173,1,143,253,168,24
2190 DATA 108,0,173,251,168,253,24,168,96,101,251,134,254,88,88,44,104,162,30
2200 DATA 141,138,3,38,34,184,168,70,141,133,3,88,173,137,3,10,10,10,10,17,137
2210 DATA 168,0,144,253,88,173,138,3,74,74,74,141,138,3,173,138,3,74,173,134
2220 DATA 138,74,74,141,138,3,141,138,3,173,138,3,41,141,140,3,173,140,3
2230 DATA 41,251,168,0,133,252,168,6,32,51,153,202,208,70,168,252,173,171,168
2240 DATA 253,133,173,32,51,188,38,84,188,84,168,251,101,170,143,170,168,24
2250 DATA 171,133,171,168,0,133,252,173,138,3,173,24,16,84,188,16,84,143
2260 DATA 133,168,168,168,101,170,133,173,38,32,253,174,38,138,171,32,247,184,88,16,84
2270 DATA 133,3,101,170,173,170,168,0,101,171,173,173,24,168,0,101,170,141,170
2280 DATA 168,88,101,171,133,173,38,32,253,174,38,138,171,32,247,184,88,16,84
2290 DATA 124,168,20,141,141,3,168,81,141,144,3,48,44,184,168,80,141,168,3,32
2300 DATA 141,168,80,141,137,3,32,34,134,168,70,141,148,3,32,34,134,184,184,70
2310 DATA 141,145,3,32,172,134,78,147,3,78,147,3,78,147,3,174,148,3,208,3,78
2320 DATA 147,3,84,174,144,3,168,147,8,141,134,3,173,145,3,108,0,141,145,1,32
2330 DATA 172,134,78,147,3,78,147,3,78,147,3,174,148,3,108,3,78,147,3,84,173
2340 DATA 144,3,108,147,3,141,136,3,141,143,3,32,187,184,38,218,188,208,144,4
2350 DATA 208,174,96,168,253,141,14,218,141,16,218,168,178,141,18,218,187,168
2360 DATA 144,24,218,173,27,218,141,147,3,28,173,138,3,202,208,174,8,168,208
2370 DATA 141,138,3,173,138,8,240,12,173,134,3,201,84,144,5,184,83,141,134,3
2380 DATA 40
2390 END
2400 FOR I=4096 TO 40999
2410 READ A: B=4+4
2420 FOR J=1,3: NEXT
2430 IF B=40976 THEN PRINT "ERROR IN DATA":END
2440 RETURN

```

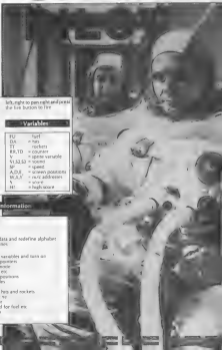




Defend yourself and your planet from the marauding hordes of aliens in this space race from Julia Teat.



# SPACE



YOU ARE IN CONTROL OF A marauding space station where you are the last defence before earth. The attacking alien hordes are after your home planet. Can you stop them?

You have a limited amount of rockets and are running out of fuel so you must hit up all your rockets else - kaput!

Once you have filled up your fuel chamber, you will be escorted to another part of the battle.

Press shift/runstop to load the game. In the joystick in port 2, you move it left to pan

left, right to pan right and press the fire button to fire.

## Variables

HU	fuel
DA	in fuel
TY	rockets
BR,TD	counters
V	space variable
V1,V2,V3	sound
SR	speed
A,D,U	screen positions
W,L,X	word addresses
S	score
HI	high score

## Program Information

Part 1  
Sprite data and instructions

Part 2  
0 - 100 Graphics data and redefine alphabet  
100 - 180 M/C routines

Part 3  
4 - 5 Set sound variables and turn on  
6 - Set sprite positions  
10 - 30 Set M/C mode  
40 - 50 Push start etc  
60 - 70 Set sprite positions  
80 - Set variables  
90 - Call BR0  
100 - 110 Push fuel, hero and rockets  
110 - 120 M/C mode on  
130 - 140 Game over  
150 - 160 Push panel for fuel etc  
170 - 180 Print wrap  
19000 - Title page





# Program Listing 2

SPACE PILOT BY JULIA TOUT 1980 PT 3

```

8 CLR
9 H=12258
10 REMOD IFM=17464158
11 FORK=H H=H+1 S=H+1 C=H+H+1 G=H+H+1
12 DATA 0, 0, 0, 0, 0, 0, 0, 48, 124, 188, 124, 118, 124
13 DATA 182, 0, 40, 124, 188, 124, 118, 182, 124, 0, 40, 188, 188, 36
14 DATA 36, 118, 62, 0, 128, 188, 118, 118, 118, 188, 124, 0, 128, 118
15 DATA 96, 124, 96, 118, 128, 0, 128, 118, 96, 124, 188, 112, 112, 0
16 DATA 68, 118, 96, 118, 118, 188, 68, 0, 188, 118, 118, 128, 182, 118
17 DATA 118, 0, 124, 96, 24, 36, 36, 96, 62, 0, 62, 36, 28, 12
18 DATA 188, 128, 96, 0, 118, 188, 184, 112, 124, 188, 118, 0, 96, 96
19 DATA 112, 112, 112, 124, 62, 0, 94, 119, 127, 187, 119, 112, 112, 0
20 DATA 54, 118, 122, 128, 118, 118, 118, 0, 62, 182, 112, 112, 188, 112
21 DATA 62, 0, 128, 182, 118, 128, 94, 112, 112, 0, 62, 182, 118, 118
22 DATA 112, 62, 18, 0, 128, 118, 182, 124, 124, 182, 182, 0, 62, 118
23 DATA 37, 62, 67, 182, 62, 0, 127, 62, 24, 24, 28, 28, 38, 0
24 DATA 182, 182, 71, 182, 182, 126, 68, 0, 182, 182, 188, 71, 182, 62
25 DATA 28, 0, 118, 118, 187, 187, 127, 112, 34, 0, 187, 118, 62, 28
26 DATA 62, 118, 182, 0, 182, 36, 62, 24, 24, 28, 28, 0, 124, 12
27 DATA 12, 24, 48, 127, 62, 0, 68, 48, 48, 48, 48, 48, 62, 0
28 DATA 12, 18, 48, 124, 48, 36, 252, 0, 68, 12, 12, 12, 12, 12
29 DATA 68, 0, 0, 24, 68, 128, 24, 24, 24, 24, 0, 18, 48, 127
30 DATA 127, 48, 56, 0, 0, 0, 0, 0, 0, 0, 0, 0, 24, 24
31 DATA 24, 24, 0, 0, 24, 0, 182, 182, 182, 0, 0, 0, 0, 0
32 DATA 182, 182, 252, 182, 252, 182, 182, 0, 24, 62, 64, 64, 0, 124
33 DATA 24, 0, 94, 182, 12, 24, 48, 184, 78, 0, 48, 182, 68, 56
34 DATA 182, 182, 62, 0, 0, 12, 24, 0, 0, 0, 0, 12, 24
35 DATA 48, 48, 48, 24, 12, 0, 48, 24, 12, 12, 12, 48, 0
36 DATA 0, 182, 58, 252, 58, 182, 0, 0, 0, 24, 24, 128, 24, 24
37 DATA 0, 0, 0, 0, 0, 0, 0, 24, 24, 48, 0, 0, 0, 128
38 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0, 24, 24, 0, 0, 0
39 DATA 0, 12, 24, 48, 96, 0, 68, 182, 118, 188, 182, 182, 68, 0
40 DATA 24, 24, 36, 24, 24, 24, 128, 0, 68, 182, 0, 12, 48, 36
41 DATA 128, 0, 68, 182, 0, 36, 0, 182, 68, 0, 0, 14, 38, 182
42 DATA 127, 0, 0, 0, 128, 36, 124, 0, 0, 182, 68, 0, 68, 182
43 DATA 34, 124, 182, 182, 68, 0, 126, 182, 52, 24, 24, 24, 24, 0
44 DATA 68, 182, 182, 68, 182, 182, 68, 0, 68, 182, 182, 62, 0, 182
45 DATA 68, 0, 0, 0, 24, 0, 0, 0, 24, 0, 0, 0, 0, 24, 0
46 DATA 0, 24, 24, 48, 14, 24, 48, 36, 48, 24, 14, 0, 0, 0
47 DATA 126, 0, 126, 0, 0, 0, 112, 24, 12, 0, 12, 24, 112, 0
48 DATA 68, 182, 0, 12, 24, 0, 24, 0, 0, 258, 0, 0, 0, 0
49 DATA 0, 0, 62, 62, 62, 68, 62, 62, 62, 62, 62, 62, 62, 62
50 DATA 62, 62, 62, 62, 62, 258, 258, 258, 258, 128, 128, 128, 128, 128, 128
51 DATA 178, 178, 178, 178, 178, 178, 178, 178, 128, 128, 128, 128, 128, 128, 128
52 DATA 182, 182, 182, 182, 182, 182, 182, 182, 182, 182, 182, 182, 182, 182
53 DATA 284, 284, 284, 284, 284, 284, 284, 284, 284, 284, 284, 284, 284, 284
54 DATA 248, 248, 248, 248, 252, 252, 252, 252, 252, 252, 252, 252, 252, 252
55 DATA 254, 254, 254, 254, 254, 254, 254, 254, 254, 254, 254, 254, 254, 254
56 DATA 0, 252, 0, 252, 0, 252, 0, 11, 0, 258, 0, 32, 0, 37, -1
57 H=H+152
58 REMOD IFM=17464158
59 FORK=H H=H+1 S=H+1 C=H+H+1 G=H+H+1
60 DATA 173, 0, 248, 281, 125, 288, 4, 32, 78, 182, 96, 281, 187, 288
61 DATA 0, 32, 78, 182, 188, 1, 141, 252, 0, 36, 281, 119, 288, 4
62 DATA 72, 72, 136, 36, 288, 182, 284, 11, 32, 39, 132, 182, 1, 141
63 DATA 252, 3, 36, 281, 118, 288, 111, 288, 0, 187, 1, 141, 252, 3
64 DATA 96, 182, 0, 141, 87, 0, 141, 252, 3, 36, 284, 284, 284, 284
65 DATA 234, 234, 234, 234, 234, 234, 234, 234, 187, 1, 141, 87, 0, 32
66 DATA 48, 182, 32, 182, 182, 32, 37, 194, 234, 244, 234, 234, 234, 234
67 DATA 94, 188, 1, 141, 87, 0, 32, 248, 182, 32, 182, 182, 36, 62
68 DATA 194, 234, 234, 234, 234, 234, 234, 38, 173, 252, 3, 281, 1, 288
69 DATA 32, 173, 3, 288, 288, 38, 288, 288, 288, 288, 288, 288, 288, 288
70 DATA 288, 3, 288, 288, 2, 288, 288, 4, 288, 288, 4, 288, 288, 5
71 DATA 288, 288, 3, 288, 38, 182, 173, 141, 3, 288, 141, 3, 288, 182
72 DATA 38, 141, 2, 288, 182, 238, 141, 4, 288, 182, 0, 141, 252, 3

```



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## Pressure Washer Working 3 (Report-1)

[illegible][illegible]



**Breadin Lewis takes a  
diverging look at some  
graphics packages that are  
available.**

THERE ARE A GREAT NUMBER OF graphics packages available for the C64, maybe this is a reflection on the difficulty of accessing the graphics capabilities directly. If any such packages are reviewed here, some good, some not so good. There are not a lot simply graphics packages, some offer sound, animation and game facilities.



# GRAPHICS SOFTWARE



## Gas Kit 64

Gas Kit 64 from Anirog is a general purpose utility package which offers graphics, animation and sound. Control of the various aspects of the package can be controlled either interactively or via program control. Again, the software runs upon the keyboard for almost all command input, rather than by the use of onscreen menus or action by the joystick. The only difference here is that to draw lines, the key must be held down as well as moving the joystick. User interaction does not come high on the list of priorities with this one.

Anirog is the graphics section of the package, though in other versions it releases the facilities. One would expect from a graphics package. Basically you can draw lines with a pencil, pencil, curves or a brush (by circles). Limited line drawing is also available, though it does not offer fill, copy, zoom, mirror, move, or any shapes except circles. As mentioned, there are only two brush sizes. The manual stated that you can draw any picture you see like thing is, you're going to have to be

very patient, and will take quite a while. It is also possible to define sprites with Anirog, but that too really isn't worth mentioning.

The next section is called Composer, this version from Anirog obviously does a with sound. From the demo which I can't run from the main menu, quite good sound effects are possible. Because you expect to play music with your hands, the package is far easier to use than its brother. You actually have to play the tune you want with the normal keys, which are shown on the screen in piano format. You can choose one or two out of ten instrument sounds at various pitches. When you've decided what you want to play and gone through the above steps, you can play the whole thing back. The tune can be played slower, the same, faster, or much faster than the original way it was played by you.

It and when you are finally satisfied with your masterpiece, various methods of storage and manipulation are available to you. You can store your data in what's called step 4 memory, hold lines display memory, append to the last in display memory and load or save with the disc.

As well as using the utilities interactively, as mentioned, they can also be used from within BASIC programs by means of commands. In there are 25 BASIC macros or commands which allow you to do everything mentioned above in the last section. The graphics section can be made use of, though the sound version is pretty good already.

## Scope

Unlike the other packages, this one is a standard 'game designer'. When coded, it moves itself up into high memory. It is from here that its routines are called by BASIC via a predefined command or BASIC statements. There are 46 new commands in all, which deal with colours, styles, move and graphics. Scope can only handle integer numbers, most of which are in the range 0 to 255 but it is possible to use double byte words that extend up the range to 65535. Scope is actually a compiler, all words are compiled into machine code, and once compiled Scope need no longer remain in memory. The use of Scope will depend on a working knowledge of BASIC.





As mentioned, Scope adds 46 BASIC entrance commands, what follows is a brief explanation of some of the more useful commands. SCR allows scrolling of the screen in all four directions. SPRTs allow set up of the number and colour of sprites. SPMAN sets up a waveform. MUSIC instructs the sound processor to play a tune. The manual covers all the operations in detail. It also gives many example programs for the user to access the complete commands.

As well as the Scope examples, the package also contains a number of demo programs. These are loaded from the tape then compiled and run. Even the compile and run commands are actually SPS calls. The demos themselves are quite a good job of showing the facilities of Scope. What they do not show that the package lives up to its boast of games designer.

As ever, the package contains a number of demo screens, and these were of a similar standard to the rest of the package. It seems that very little effort has been put into this, though nearly all the usual facilities are available, they are all at such low standard. I very rarely notice screens in the market, but the best thing about this system was the good bye option on the screen, even there, it had the clever touch of not making it possible to leave the program!

## Doodle

This is another package heavily reliant on the keyboard, even though it is designed for use with a joystick or trackball.

Unlike some of its rivals it also does not use icons and windows for menu selection. This seems a shame because, even though icons are one of the latest buzzwords, they do actually make things much easier to use in most cases, and most definitely with this type of package.

This is actually the third package I've looked at and so far the various methods of drawing lines etc. have all been different. This is probably the most difficult to get used to. Actually, it seems that even with pointers, in future will still be made, particularly when line drawing. On the other hand, the fill is excellent if you don't use the usual brush ones. If you do, the fill colour leaks out and it's the whole screen.

One of the main drawbacks for me when looking through it was that I didn't have a trackball. I was able to find down then I wouldn't have had to rely on the joystick for cursor positioning. Drawing straight vertical and horizontal lines is great but any longer selections are very time consuming as you need to make the pen speed every time. The one advantage of using the joystick is that you don't get time breakups when in search mode as you do with the mouse and the touchpad for other graphics features.

As with the previous packages, this one contains a disc and printer input/output section allowing the user to load and save pictures for doodles as QWERTY calls them and also dump screens to a printer. The demo screens were of a high quality. I congratulate the person who actually drew them, it must have taken some time, drawing of course that

Doodle was used to draw them.

## Activity centre

Of all the packages reviewed, this was the first that offered more than single graphics and/or sound effects. This offers a music screen whereby the user can design their own tunes. Also, the files here are called pages rather than screens, implying that some form of text processing etc. also be done. As a bonus, it is also possible to produce animations. I was a little dubious when I read this part but read on and all is well for me now.

Activity centre is a musician, it should say. The called Activity Centre (everything is so done, whether it be line circle or fill. When I say fill, don't be misled, this version of it simply allows you to define a rectangle to be filled with, any complicated shape could and probably would take a day.

The only one any I've found with some of the other packages that sounds on the keyboard for most of the command input. It does this courtesy of other additional features, these being animation and music. Animation allows you to define two shapes that will alternate while moving. The music section is probably the best of the three, and this isn't wonderful by any means. It allows you to define notes from the musical scale, vary their length and let them be sharp or flat. Once you've done this, the tune can be played and/or saved. Various pre-defined instrument sounds are available to enhance the range of what really is a limited utility.



**Get to grips with Commodore graphics with this range of hardware reviewed by**  
**Brendin Lewis.**

The Apple Pad is an excellent graphics aid

# GRAPHICS HARDWARE

WITH THE WIDE SPREAD USE of microcomputers with high resolution graphics, it seems reasonable for a number of companies to produce hardware to make things a little easier to use. This article covers four such items of hardware: two lightpens, a touchpad, and an electronic mouse. All these hardware packages contain some form of software so this is covered as well.

## Magic mouse

Though not the first mouse I've used, this is the first that I've encountered for the C64. The immediate impression one gets when the mouse is unpacked is that it's more of a cat than a mouse. The size of the Magic Mouse is rather larger than that of the Apple Mouse which is the one supplied by Microsoft.

Other than its size, the mouse is well constructed. The electronic mouse got its name because of its shape and the fact that the cable came from the back. (It's a cat.) Using this analogy, this poor beast has a tail growing out of its ear (antenna) which is a tail. The mouse has quite comfortably on the hand and has three coloured control buttons on the front. Underneath is a tail and tail housing. The tail housing in this case has got a pointer, cursor. I can see no advantage in this as it just seems to gather more dirt than the normal type. The pointer thing is a difference to the norm as the two positioning screws. These are used to ensure correct positioning of the mouse cursor on the screen; the problem is that they don't — the cursor will go off the screen.

Along with the mouse come four software packages: a hi-res graphics

designer, and both sprite and line designers. The first piece of software is not really a package, it is the control software to let you build mouse routines into your own software. Of the three packages, the lines designer is the most interesting. It allows the user to draw lines, circles, fill shapes, change foreground and background colours etc. The package itself is fun to use, though there are some faults. Even positioning of the mouse is difficult thus posing lines for filling is a little bit and time.

Filling shapes has always fascinated me, so one of the first things I did was to draw the most complicated shape I could think of. Filling the inside of this shape was a marvel to watch. Although slow, it did do a perfect fill. Presumably the time it you get lots of colours on the screen at the same time and then try a fill. The result is very similar to the effect on the Spectrum where colours go into a pixel pattern. This is due to the fact that the fill will not a lot more than three colours to occupy the same block of 4KB (at the same time). All that is required is a little time when choosing colours that are to be next to each other.

The user and sprite designers are very similar in operation, with the same screen layout. Positioning the mouse is not so much of a problem as the one as the cursor always goes to the nearest point or

the enlarged pixel layout. All these packages were well designed and easy to use.

## The Kozla Pad

The Kozla pad is a touch-sensitive pad, and a peripheral not often seen on mice, as they are normally only found on expensive computer aided design (CAD) systems. They offer, as does this one, a big advantage to the user over joysticks, lightpens and mice. This is that the user actually draws on a flat horizontal surface, in much the same way as with paper and pen. The mouse is the only thing that comes close, but the continuous feel takes some getting used to.

As with all the peripherals in this article, the touch pad includes a graphics package. This is quite similar to most of the mouse, but of a higher quality. Positioning of the cursor on the screen is much easier as only the hand and eye are used as opposed to the hand, eye and mechanism of the other devices. In fact you can actually trace the image with your finger or with a purpose-built stylus.

The graphics features include: line, arc, circle, text, as does the mouse software. Additional features are available in raster imaging, where anything drawn is retained in the other if we corners of the



screen. Zoom, where a portion of the screen is enlarged for line work. Copying and mapping of various parts of the screen to another. An option called copy which repeats the operation performed by the previous command.

Finally, shaded colours are available, where the normal colour is cross hatched with the current background colour. There are usually two graphics screens available and the command menu allows the user to alternate between the two. The other command that we see both screens is the copy command. This allows you to copy a portion of one screen to the other and vice versa. Then when using the device, there is one called VWH which is the shell of a motor saw. There is also another which contains all the accessories for the van like wheels etc. By loading both these files, one can each graphic screen the whole picture can be made up by moving parts of one to the other.

Although it is simple line and multiple line are pretty standard, this software does make a rather good job of the line. Line and multiple line use rubber band software, so that the line can be seen before it is drawn. The fill is far more efficient and a lot quicker than that with the mouse software. When circles are defined they can be moved to any part of the screen before drawing commences.

expensive to direct the light. Also, some form of switch is required so that the pen is only active when required. The switch contains the form of an actual switch built into the pen, touch sensitive contacts on the pen, or some kind of similar switch built by one or more of the keys on the keyboard. The keyboard method is the most convenient of the three, as it requires both hands to operate.

The Edumatic pen is an actively styled, with a thin cylindrical pen and cord lead. Contained in the package as well as the pen is the Peripherals Inc. graphics package; designed for the pen by the same manufacturers. The package itself contains all the useful features plus a line of icons.

One of the most interesting features is the pointers. For those of you who have seen the Marquis package for the Apple Macintosh, you will have already seen this feature. Simply, instead of only being able to draw, paint and fill is only one colour you are able to paint with up to 16 colours. These are 16 colour palette of cross hatching, bars and stripes etc and are perfect for filling and painting. They do cause a problem when in this mode, they cause strange dotted rather than solid lines. Thus, when using this mode, it is wise to use the more usual solid colours in the normal way.

The first utility allows you to access the data for a directory or to run programs. The game is slow and easy to beat, but obviously isn't its purpose. For most allow you to play when pointed at the screen by touching the pen to them.

## Data Lightpen

As mentioned previously, all light pens work on roughly the same principle: the one though offers one major advantage. Unlike most lightpens, which react to all types of light, this one is tuned so that it only reacts to the high frequency light signals that are produced by televisions and monitors. This is difficult to prove, but the pen does have an LED light emitting diode mounted into its case which does come on when held up to the TV screen but it normally not lit. Also, on the Edumatic pen, the pen has a switch mounted near its tip.

There is also one major difference between this package and the others. The whole thing is designed as a budget system, there are no fancy boxes and more as with its case. From the hole for the LED looks as though it's been gouged out with a knife. The one thing that must be remembered is that even though it doesn't look too much, it doesn't therefore mean that the pen itself is going to be poor. In fact the pen itself is very comfortable to use, and it's a shame that there is no more software available for use with it.

The software that comes with the pen is pretty basic, the first is an menu package which lets you know what the pen is and how it works. This is done by displaying the status of the LED, the status of the switch, and the coordinates of the pen on the screen. Finally it lets you drag eight different coloured spots around the screen, just for fun.

The second program on the tape is called Co-ordinate and is not upto much; drawing is limited to the large, coarse sized blocks. The accuracy of the pen is poor here, with the cursor being about three blocks away from the pen. As the response to the button is very slow.

The final program is the high resolution drawing package. I was quite looking forward to trying this one after seeing the accuracy of the previous software. The software offers the following drawing modes: line, dot, curve, connect, and area. The problem was that only dot mode could be accessed and this was widely inaccurate from the previous ones. It should have been possible to swap modes by using the pen, not the mouse. As you will have gathered, the demo software provided with the pen was not of a high standard. The important thing here though, is that all the pen control routines are available to the user for them to build into their own programs.

The mouse mouse is extremely well constructed



Another nice feature is the start/stop section of the software, this allows the user to stop between the loading and saving of picture files. A number of demonstration picture files are supplied on the disk of which are high quality but my heavy handed drawing soon destroys these good looks. One thing to look out for is the picture to and from saving is the only way to describe it.

Overall this system is a joy to use, the graphics package has a lot, the mouse pen was completely useful to use though my only criticism might be that the actual touch surface could have been slightly bigger therefore.

## The Edumatic Lightpen

The lightpen has always been a popular peripheral for use with graphics packages, mainly due to its cheapness and versatility. Various types are available though it is, screen on battery, the same principle. All use some form of photo-

One option which is different to the others is the fill mode, this package is helps to use if the shape is closed before it attempts to fill it. If it isn't then it simply points to the place where the gap is so that it can be repaired before refilling.

Like some of the packages, all options are selected on the screen, this makes it all the more a shame that there is no switch on the pen itself. This very minor problem aside, the pen is quite accurate, if rather slow when drawing. There is an option on the menu which offers a trade off between speed and accuracy. This is not divided into steps between accurate but slow to fast but not so accurate. A very useful feature but possibly few users are too busy, I only used the last it and the others.

The demo software that comes with the pen is not part of the main graphics package. Four programs are provided, a drawing routine, also utility, a 100 character menu and pen menu. The drawing routine is similar to the draw section of the main graphics package and is nothing special.



# COMPETITION

Polish up your clubs for our  
armchair golfers competition.

IF YOU'VE ALWAYS THOUGHT THAT golf was not the game for you - all that getting stuck in bunkers and looking for lost balls - then think again. You can now sit comfortably in your own home and let your Oki do all the hard work for you. *Head Games' latest release, Jack Feldon's Open*, is the prize we're offering in the month's competition. The game would set you back £19.95 if you hand-carried pocket money if you went out and bought it, so it's well worth the effort of entering our super easy competition.

We've got 50 copies of the game to set you on the path to golfing superb realism so we're going to make a lot of readers very happy.

The new A&E game is based around the British Open Golf Championship, which was held at Sandown in Kent this year and the course reproduced in the game.

Playing the game is very realistic, you can choose which club to use and take your pick out of different ones. You must then decide on the angle of your shot and also on the strength. This is when the fun starts. If you're a top hand you can end up with all sorts of problems. There's a very helpful hint facility which passes you your cards and gives you advice if he thinks you've picked the wrong one but he's also very quick to make rude comments about your play if he thinks you're not up to Open standard.

You can also view the whole course from above to find out exactly where you are and how difficult it's going to be to get back to the green.

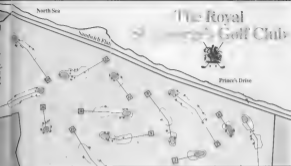
There is a data and instruction booklet which explains such complicated points as the scoring system. It also gives particulars about the different types of clubs so you should be able to pick the right one when the time comes.

If you want to sit in your own home playing this awesome sports game, read on for details of how to enter.



Prize's Golf Link





### How to enter

Study the two cartoons – there are a number of differences between them. Circle the differences on the cartoon attached to the coupon. Also the you pin clearly and fully and send the cartoon and coupon in an envelope. Write clearly the number of differences you found on the back of your envelope.

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Important: please follow closely the guidelines on entering – incorrect coupons and entries with no numbers on the back cannot be considered. If you are unsure, the coupon will act as a label for your prize so clear writing is essential.



### The rules

There is a total of 100 prizes in the competition. The prizes are: 10 x First Prize, 10 x Second Prize, 10 x Third Prize, 10 x Fourth Prize, 10 x Fifth Prize, 10 x Sixth Prize, 10 x Seventh Prize, 10 x Eighth Prize, 10 x Ninth Prize, 10 x Tenth Prize. The prizes are given to the winners of the competition.

The prizes will be sent to the winners by post. The prizes will be sent to the winners by post. The prizes will be sent to the winners by post. The prizes will be sent to the winners by post.

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Dave Crip investigates more programs that will tidy up your business.



## BUSINESS



# BUSINESS FILE BUSINESS FILE

### Anagram Sales

IT IS A NEAT CHANGE TO HAVE SOME really good software to write about, especially software which can grow that the 64 is a machine which really can be useful to the business man.

Anagram is a name that has been about for almost as long as Commodore. It has produced software for most of the Commodore range and if you find a Commodore, get running, business software there is a good chance that it will have Anagram programs.

I first used Anagrams when I bought a ledger before I got hooked on computers. That was on a Pet. When I found that sales ledger must be running the same program it has been improved of course but the style was the same. Less to see and hard to mess up. Why change a successful formula.

### Sales Ledger

The mechanics of all sales ledgers are essentially the same. Running a ledger can appear very easy or really complex. Anagram make it almost as easy as it could be for a new bookkeeper. It would do help things if you read a book such as *BOOKKEEPING MADE SIMPLE* but it is too no money value. The Anagram manuals are easy to read and go through the whole process step by step.

### Capacity

If you are thinking of running a sales ledger the first thing you must be very

careful and realistic about its capacity. Of more than one occasion I have seen people stuck by underestimating the number of accounts they have or the number of outstanding amounts the average amount has, look into the future, think about expansion and prepare.

As a guideline Anagram offer credits and accurate maximums. 120 customers with 15 invoices outstanding (max) without settlement discounts. 150 customers with 8 invoices outstanding (max) with settlement discounts. 175 customers with 25 invoices outstanding (max) without settlement discounts. 175 customers with 75 invoices outstanding (max) with settlement discounts.

This should be adequate for many business firms.

To quote the manual. Trade discounts given line by line and/or across the invoice as a whole, are allowed for and provision is also made for settlement discounts. An invoice may be of up to 25 lines. Cash is posted to customer accounts, and a suspense account provision for cash which is received but cannot be allocated. The reason I have quoted the manual on this is because they have described it at the best way possible.

### Hardcopy/Reports

Again to quote the book the reports available are:

CUSTOMER NAME VENDOR NAMES  
MATHS LIST  
A/C DEDUCTIONS



#### CURRENT CUSTOMER BALANCE, PAYMENTS AND DISCOUNTS (CARD, SUMMARY ACCOUNT LISTING)

There is little that can be said about so a ledger without wondering on about what they should do and where they should be used. Anagran Sales Ledger is a very good program and very professional.

It has been used several days on the job by many businesses and has a good going that few other programs can claim.

I have looked long and hard at many sales ledgers in order to operate one myself. I know one because it has not let me down. And certainly makes my accounts payable to the accountant and I think I'll pay for each.

Good one Anagran

#### Electronic Files

MS FILE is a database program. Not in the same league as dBase or dBase II, but not as simple as the dBase type. It falls midway between both. It's a bit. It only tells between the two with the addition of MS REPORT but more on that later.

#### Create

MS FILE allows you to create a card index type record by moving the cursor around the screen while typing in field based info. An unusual feature of this is that each "card" can contain up to 32 "cards", for those with verbal databases this should allow them to squeeze everything in.

Once your card is designed you can save the temp are ready for filing in. Because of the structure of the program and its use of random filing it is only possible to have one created database per disc.

Depending on what you want the file for this could be either good or bad. If you find the per disc limit confusion.

#### Forget a field?

If you're using your file for a where you decide you need to add an extra field or somehow make slight modifications to the file it is a quite simple thing providing you have used less than 50% of the file. This is a nice touch as it is often only after some use that you find you need an extra field for the old concerns.

I was quite disappointed to find that files created by MS FILE could not be transported to wordprocessors. At least if they can't it was not in the book. This is a definite restriction as I find that one of the most common uses for a database is to create a mailing list.

#### Hardcopy

To protect the information you have in your database you can design a print template. You can choose which fields are

to be printed and they can be printed with or without the heading. You can even print out fields in the order in which they appear on the file, although in most cases this is not an improvement.

Searches can be made on either the key field or match field. The program sets out queries on the keyboard in about 5 seconds. I found that quite impressive but on the other hand, were reasonably quick. Searches on the main body of the file was a very different story and seemed to take forever.

Reports can be sorted on any field and can also be printed according to the sort.

#### File report

Then came MS REPORT, its sister program. This claims to be the piece of software that makes MS FILE complete. In my opinion this is the piece of software that was missing in the first place and should have been part of the first program.

As its simplest MS REPORT allows more versatility in printing out your files. Quite complex designs can be built up even tabular reports can be printed.

The main benefit though with MS REPORT is its facilities to calculate. Running totals can be kept and printed within throughout a print run. This is particularly useful with for such as stock cards and records of payments/receipts.

#### Close encounter of a similar kind

Its style is the same as MS REPORT and so learning to use it is easy.

Comprehensive research and sort facilities are provided once again and criteria for printing/sorting is adequately explained in the manual. This program is the one that saves the database from a mere database to a user-programmable database.

#### Big means

If while you are using your report program you find you need to add a card. Tough. Turn off. Load MS FILE. And remove. Turn off. Load MS REPORT. Carry on with what you were doing. In practice it is as tedious as it sounds. Three bits of at least have been an option to load the other program both within its opposite number. A grave omission and one which would have made it far more versatile.

#### How do they rate?

On the whole then not so good. Very professionally presented and would have seemed very good if it had been released about a month after the file was released but now gives the impression of being a little dated and tired.

It was of 70





implemented and expands on one of them by allowing programs flow to branch to a second location and then return a line. Unlike standard BASIC, it is necessary to precede and follow the GOTO with a colon.

SCOMP is one of the 'word' commands contained in Simon's Basic. Its function is to re-convert the line position of the last IF THEN ELSE line. Example in the manual text illustrates this.

```
10 A=100
20 IF A=0 THEN PRINT "HELLO", ELSE
   "BYE"
30 SCOMP PRINT "WELL", ELSE PRINT
   "STRANGER"
40 SCOMP, PRINT "WELLCOME" - ELSE
   PRINT "WELL YOE, AGAIN I HOPE"
50 GOTO 10
```

Not a command that you're going to use every day!

Two new loop structures have been added, namely DO UNTIL...NEXT, and LOOP UNTIL DO...NEXT. The UNTIL...NEXT construct (which is part of the Pascal programming language) is usually a loop all over to be repeated until a condition is met. The second type of loop is similar except it is a loop more than one condition to be placed anywhere within the program block. Very handy, but not very structured.

Finally, a form of procedure is added. A Simon's Basic procedure is a group of lines enclosed by a PROC name and END PROC. The named procedure can be executed by using CALL name, which will jump to the procedure (ie GOTO), or by GNC name, which now returns control to the next line (ie CALL). Simon's Basic doesn't cater for parameter passing, which is a pity, as it does have a crude implementation of local and global variables.

## Breden's Basic

This package is very professionally presented in a matching binder and an excellent 160 page cross-referenced manual. The software that is available on tape, disc or cartridge, and contains over 160 commands and functions. The areas covered include: sprites, graphics, sound, I/O, numeric, error mapping, programming aids and so on.

The package is quite complex to use and I wouldn't recommend it to a beginner. Unfortunately, the version used for the commands appears lost, and this makes remembering the commands and functions a little difficult.

The main feature of this package is the graphics/sprite handling - almost everything you could need in these Breden's Basic does include other interesting features such as a comprehensive set of mathematical

functions (see table 1).

Eleven sprite commands is one for the definition and manipulation of sprites. A sprite (shape in Breden's Basic) is defined with the MCHS/OT command, which stores the shape of a MCHS into one of the 16 slots. There are no special skills to facilitate sprite design, and even are

referred to by the sprite id (ie from Vector).

It is possible to enable, disable, set redox, expand and alter priority of a MCHS with individual commands. It is also possible to do the same thing with per command - MCHOS. This has 10 parameters, and if used correctly contains an program space.

Table 1 - Superbasic graphic commands

Command	Description
HSHS 1,2	enables high-resolution screen including border '1' and background '2' colours
GRAPH	displays the high-resolution screen
TEXT	enables the text mode
WINDOW 1	creates text window at location of high-resolution screen with height in pixels at '1'
POINT 1,2,3	plot a point on high-res screen at row '1', column '2' and in colour '3'
MODE 1,2	changes effect of plot (ie plot, erase, invert etc)
DRAW 1,2,3	draw a line from current graphics cursor position to row '1', column '2' and in colour '3'
MOVE 1,2	move the graphics cursor to 1,2 without plotting a point
CHAR 1,2,3,4	display a text string '1' in high-res mode at 1,2 in colour '3' using character set '4'
SHAPE 1,2,3,4,5	plot a pre-defined shape (ie 1) in colour '2' (width has a height of '3', and a string of digits '4' is used to define plotting action)
POINT 1,2	function which returns status or pixel at 1,2
PAPER 1	changes background colour for high-res mode
ALICE 1,2,3	change all points of colour '1' to colour '2'
XCOR 1	short term or leads a high-res screen
BLANK 1	used to turn off or on the screen display. This will slightly speed up a program



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Mike Hart produces a few more handy utilities to add to your collection.

# RELIABLE ROUTINES

Program Listing

IT IS PROBABLY NO LONGER news to say that more time has been devoted to devising efficient sorting methods than to any other single problem in computing — this is not surprising in view of the fact that sorting methods are so important, particularly in commercial programming.

In general terms, the sorts that are quick and easy to code such as the infamous 'bubble sort' take a fairly long time to execute while the more efficient sorts, such as SHELLSORT and QUICKSORT achieve their speed by utilizing much more complex algorithms.

In this article, I present two sorts — the bubble sort and the second in much neater tools. They are both based upon the SHELLSORT method which is a reasonable compromise between speed and complexity. However most of the saving in the accompanying sort is concerned with the matching code version of the SHELLSORT about which there are

## Shellsort — BASIC version

One of the problems with sorting methods that involve using arrays is the dreaded 'garbage collection' problem at many of the CBM BASICs. This arises when the memory becomes cluttered up with redundant strings and the computer pauses for seconds or occasionally minutes to clear the unwanted strings out of memory. The solution to this problem is to ensure that the string data does not actually move around in memory but stay exactly where it is stored. Individual array elements are 'pointed to' by a pointer array and while it is the arrays themselves that are compared it is these pointers that are actually swapped. This is the method employed in the BASIC version of the sort

### SHELLSORT-M.C.O.D.E

```
1 REM *** SHELLSORT-M.C.O.D.E ***
2 :
3 REM ORIGINAL CODING FOR PET BY
4 REM GAYE BARRETT & GAYE WARDILL (1982)
5 :
6 REM ADAPTED FOR C64/VIC AND HYGE
7 REM
8 REM RELOCATABLE BY
9 :
10 REM
11 REM HERE HART (1985)
12 :
13 REM SYNTAX IS:-
14 :
15 REM SYS (LOC'ING),HLEN) ... OR
16 REM SYS (LOC'ING,HLEN) ...
17 REM WHERE H=START (USUALLY 1)
18 :
19 REM STRING ARRAYS WILL BE STOPPED AT
20 REM THE FIRST 'NULL' STRING ...
21 REM USEFUL TO KEEP A 'TAIL' INTACT.
22 :
23 REM FOR VIC THEN CHANGE BYTES 3,8,14
24 REM FROM 174,176,178 TO 208,209,217
25 REM CHECKSUMS IN 208-211 TO 1048,105
26 :
27 REM IN VIC OR C64 LOWER MEMORY BY
28 REM POKE 28,PEEK(28)+2:CLR
29 REM AND IN LINES 100,1048 THEN HARE
30 REM LN=THE VALUE OF PEEK(28)+255
31 :
32 INPUT "LOCATION-TRY 50000" :LN
33 IF LN=0 THEN LN=50000
34 PRINT:PRINT "READING CODE ..." :PRINT
35 FOR J=LN TO LN+255 STEP 8:G
36 FOR K=0 TO 7:READ X:POKE J+K,X
37 T=X:INVERT:READ CH:IF CH=T THEN 178
38 PRINT:ERROR 10:LINE100+0:END
39 GOTO INVERT:J:PRINT
40 :
41 DATA 32,203,174,32,133,176,165,14,205
42 DATA 248,3,78,8,173,163,13,208,209
43 DATA 4,168,8,208,2,169,3,133,203
44 DATA 231,168,4,177,83,201,1,208,1687
45 DATA 233,208,177,23,178,208,177,23,1347
46 DATA 20,223,168,133,232,133,168,133,1681
47 DATA 223,161,133,233,133,161,165,71,1255
48 DATA 133,111,165,78,133,112,165,13,204
49 DATA 248,24,169,8,133,28,133,21,792
50 DATA 168,24,177,71,248,29,163,71,143
```

passed from lines 3000 onwards. A collection of randomly-generated strings already been fed into two electrical arrays, A5 and A6 in lines 1000-1007. Addressed by the machine code (line 400) the electrical array in A5 is to be used for the BASIC format. In lines 3000-3010 a 'pointer array' is dimensioned and an entire number ranging from 1 to the % of the total array is fed into it. The sort mechanism in line 1000 has been expanded to 5 lines for readability although it can be squeezed into three. There is some pretty complex coding included here but for our purposes we might note that it sort 500 strings 'pointed to' by the pointer array are compared while the range (if necessary) are made to the percent character in line 3340. There is also an interesting use of a DO-WHILE loop in the outer 50 loop which keeps while M is greater than 5 but drops out otherwise. This array makes the program highly efficient for a BASIC program as the alternative would be a GOTO statement. Loops are twice more efficient than GOTOs as the addresses are held internally on the stack and line numbers do not have to be 'taught to' by the BASIC interpreter which can have a marked slowing effect, particularly at the end of a large program where there are many lines of code to be searched. The BASIC version will take about 120 seconds to sort 500 strings which is actually considerably faster than a bubble sort which could well take an hour for a sort of this magnitude.

# Shellsort — machine code version

This is a very long and complex version of SHELLSORT in machine code but its some extent is an 'algorithm-aiding' model. It was written — a VBC by Burton and Maselli — my own contribution to it has been to ensure that a bit transfer successfully to the C64 and the VIC and also to make it completely relocatable so that it can be put into any idle area of memory.

## Program (lines 1-1000)

```

010 DATA 101,001,130,71,144,0,000,70,1000
021 DATA 04,000,000,000,0,000,01,000,001
032 DATA 00,000,000,144,000,100,01,000,1000
043 DATA 003,144,000,100,00,00,104,01,001,1001
054 DATA 0,170,0,100,0,000,0,00,000
065 DATA 100,00,100,01,100,000,100,100,1070
076 DATA 104,000,104,101,70,101,100,100,0000
087 DATA 000,00,100,101,000,00,000,10,1000
098 DATA 040,00,100,0,177,111,100,100,0070
109 DATA 100,177,111,100,00,100,177,111,1000
120 DATA 100,100,111,140,00,000,00,000,1000
131 DATA 0,000,100,100,110,140,00,100,1001
142 DATA 000,000,0,100,000,040,10,000,1000
153 DATA 000,04,100,0,101,111,100,111,000
164 DATA 144,000,000,110,04,144,000,00,1101
175 DATA 100,101,100,110,100,100,100,100,1170
186 DATA 100,10,000,4,0,100,00,110,000
197 DATA 0,100,00,110,04,000,100,101,700
208 DATA 100,100,100,100,101,101,110,100,1041
219 DATA 110,170,100,100,000,00,000,100,1001
230 DATA 100,107,170,100,000,000,101,100,1071
241 DATA 100,100,100,10,000,4,0,107,770
252 DATA 00,100,0,107,00,100,100,04,007
263 DATA 101,107,100,107,100,100,100,100,040
274 DATA 000,100,111,100,00,04,101,107,040
285 DATA 100,107,100,110,100,100,101,100,000
296 DATA 100,100,100,00,100,101,100,100,1000
307 DATA 100,100,000,101,04,101,100,100,000
318 DATA 100,100,100,101,110,100,100,100,007
329 DATA 10,000,100,100,1,177,000,40,000
340 DATA 170,00,177,101,40,170,00,100,010
351 DATA 177,100,000,101,144,04,000,74,1000
362 DATA 000,100,4,40,040,10,07,170,040
373 DATA 144,144,100,177,101,40,144,10,007
384 DATA 100,177,101,000,100,144,0,000,1000
395 DATA 40,000,100,4,40,040,10,40,700
406 DATA 100,4,177,100,170,177,101,140,1000
417 DATA 100,100,140,101,100,10,040,100,1000
428 DATA 101,00,000,100,100,101,100,100,000
439 DATA 000,110,100,100,144,10,107,110,1000
450 DATA 144,0,000,100,100,101,107,111,1004
461 DATA 170,144,100,00,04,101,001,100,1000
472 DATA 00,100,100,100,0,100,100,107,000
483 DATA 100,144,174,000,170,100,00,107,1000
494 DATA 107,144,100,170,100,100,0,177,1000
505 DATA 100,000,101,144,0,04,177,101,000
516 DATA 000,0,177,100,100,00,00,000,177,1001
527 DATA 100,100,04,0,177,101,100,00,700
538 DATA 0,100,0,000,041,100,0,177,000
549 DATA 07,41,107,100,000,177,00,41,000
560 DATA 107,107,004,144,10,000,170,000,1004
571 DATA 100,00,40,000,100,0,177,100,000
582 DATA 000,101,170,100,100,0,10,100,000
593
1000 FOR G=0 TO 500
1010

```

## Program Listing - (cont.) -

```

1000 INPUT "HOW MANY ELEMENTS?" J:PRINT
1010 J=ABS(J)-1:DO WHILE SEED RANDOM VALUE
1020 DIM ARR(0) TO (J-1):LEN=J:SEED=0
1030 FOR J=1 TO N:FOR K=1 TO 4
1040 ARR(J)=ARR(J)+CHR$(RND(1)*255+65)
1050 NEXT K:ARR(J)=ARR(J)
1060 PRINT J,ARR(J):NEXT J
1070 T1="000000":SYS 1,4,ARR(1):T=T1/50
1080 PRINT
1090 PRINT "SORTED LIST (MACHINE CODE)"
1100 PRINT:FOR J=1 TO N:PRINT J,ARR(J):NEXT J
1110 PRINT
1120 PRINT "MACHINE CODE SORT TOOK "T"SECS"
1130 PRINT
1140 PRINT "..ANY KEY TO CONTINUE?"PRINT
1150 GET A:IF A=" "THEN 1170
1160 :
1200 DIM P(5):REM POINTERS FOR BASIC SORT
1210 FOR J=1 TO N:P(J)=J:NEXT J
1220 :
1230 PRINT "BASIC SORT":PRINT
1240 FOR J=1 TO N:PRINT J,ARR(J):NEXT J
1250 PRINT:PRINT "NEW SORTING (BASIC).."
1260 PRINT
1270 :
1280 T1="000000"
1290 H=H/2:FOR A=-1 TO 0:FOR J=1 TO N-H
1300 FOR H=J TO 0 STEP -H:L=H+H/2=0
1310 F=0:IF ARR(J)>ARR(L):F=1:THEN F=1
1320 IF F THEN J=J+1:FOR C=L+1 TO H:ARR(C)=ARR(C-1)
1330 ARR(L)=ARR(J):NEXT C:J=J+1:ARR(J)=ARR(J)
1340 H=H/2:NEXT J:NEXT A:END:CLS:GOTO 1000
1350 T=T1/50
1360 :
1370 PRINT "SORTED LIST (BASIC).."PRINT
1380 FOR J=1 TO N:PRINT J,ARR(J):NEXT J
1390 PRINT:PRINT "BASIC SORT TOOK "T"SECS"

```

## BASIC - FLASH

```

1 REM *** BASIC-FLASH ***
2 :
3 REM ** HOWE HART **
4 :
5 PRINT "START..."PRINT
6 A="END OF PROGRAM WARE YOU SURE?"
7 CL=10000000000
8 IF CL>0 THEN 100
9 END
100 FOR J=1 TO 10:PRINT J,ARR(J)
110 PRINT:GOTO 80
120 :
1300 REM FLASH 0/0
1310 PRINT A: FOR J=1 TO 10:NEXT J
1320 PRINT "ARR(J)"
1330 FOR J=1 TO 10:NEXT J
1340 GET C: IF C=" " THEN 1300
1350 RETURN
1360 :
1370 :

```

As it is so long, the BASIC order will enable a checker to make an every line of error to help to minimize typing errors. Just now here that if you put two numbers in the wrong order the macro will not generate an error but the code will not run correctly.

The sort will sort either real or string arrays (but not integers - read them into a real array if necessary). The array can be anywhere in memory and you can specify the starting point for the array which is usually placed 1, leaving 0 as a header or a name for the use of string arrays. The routine is designed to end as soon as a null string is encountered - this means that you can insert a null string at a particular point to generate an end and thus prevent a 'fall' of data if this is what you want to do.

This sort is extremely fast - even for machine code. For example, it will sort 500 arrays in just over 4 seconds (reference a comparable machine code bubble sort takes about 10 seconds). In the same coding actually runs a log normal in speed and the time-line to use with two types of arrays. It will not work, though, with two-dimensional arrays. In memory dimensions, it is not too slow in the BASIC sort and will work by manipulating pointers in the string 'header' rather than the string 'header' - this is not explained and illustrated in the article on machine code by A.P. & D.J. Stephenson in the July-July issue of Your Computer.

Full instructions are given for adaptations for VAX systems who do not want to include it at the top of memory. For PC/XT 16, MS-DOS 2.0 CLM (no) don't make to give you 512 bytes space at the top of memory (the header itself is 64 bytes long).

## Note

In the keynote of Your Computer we omitted the BASIC-FLASH listing from this article. We now print it and apologize for any inconvenience caused to our readers.

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Commodore memory used if runs on \_\_\_\_\_

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Other computers/terminals run all or part program  
runs on a third computer or vice \_\_\_\_\_

Does your game need an arc joystick? ☐ Yes ☐ No

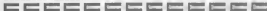
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- 10 Killstart
- 11 Embroided
- 12 Air Walk
- 13 Pole Position
- 14 Everyone's a Wally
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- 16 Spy Hunter
- 17 Raid over Moscow
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4. *Journal of Management Studies* 1996, 33, 103-116

Runecaster delves into a number of new adventures, including some for the Planescape

SOME MONTHS AGO I COMMENTED, early December, on a book called *The Secret of the Master Key*, published by Addison-Wesley of Menlo Park. The book promised an intensive program for you to type in, together with some of background material, the "secret" of what the universe is.

Other programs that create an adventure theme currently incorporate some time to food, but an unusual movement control source and does not feature particularly low responses. One low intervention program of control and movement source and

And there it is! And there it is! Using a simple format "The Assassinator" also enables you to create an interesting adventure game.

The programming language C++ provides extensive user-orientated capabilities. Programmers are not in such a manner, that you must keep in our Monday and Tuesday and Wednesday about the following Sunday. An Adventure can be very exciting.

The parser itself is not only very slow in many classes (VSEB+ACQU) [cf. VSEB+ACQU+ACQU] (marked slow with heavy input sources). Moreover we cannot use the standard Parser, Search, Lg, Stream etc. The usage of commands gives us the very small, so at least there should be no frustration in trying to find the correct words.

(C) 1986

There is no command to *kanishi*, again adding to the simplicity of *kanji* entry. Response to input is not that there is no means or means about.

The attraction of *The Amagami* spans from the simple, direct playing style to the storyline. Again, the book supplies much needed ground material, and the adventure, and is a good 'read' in its own right.

The scene is set on land, far in the future, with the insects having taken over from mankind, and any other humans left being

One man engaged (and to whom?) having various clues behind him: can you follow him? The book has a host of intriguing (and (original) ribbons) of information. Can you lead between the lines and make sense of them?

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will have a quick browned, if you haven't got time to lay in the program (that is a good work-around). There is a stream of the program for purchase from Amazon.com.

1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 26

It's just these young children, the younger ones, who, I think, need to be introduced to the joys and frustrations of adventure gaming. Admittedly this could mean less time for you at the keyboard than there may be time to help you in the future.

There are lots of fun programs daily, games and handicrafts, a model for young photographers. Microsoft has created five educational games aimed at the very young. "Cassiopeia" is an interactive astronomy program. "Cassiopeia's Journal" takes us through an adventure in the space that we

1. *Journal of the American Medical Association*, 2000; 283: 2689-2695.

Casper has not yet appeared as an awarded patent holder. Children's nontransgenic interest in the article has grown, but, like *Newsweek*, was the outward expression of Casper himself. Casper's Twelve is a middlebrow, mainstream story, with some engineers' different readings, dependent upon the choices made in the story itself.

Flourens and Lash recognition may allow the store and a keycard to be supplied to fit over the function keys to help store the choices to be made. A book accompanies the machine, which relates the program stored on the choices to be made to its results.

Two adventures aimed at the 7-14 year old in *Super Game: The Adventure* from Typhoon, written by Brian Howard and Mike Woodruff of Adventure magazine, based of course on the B&B.







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